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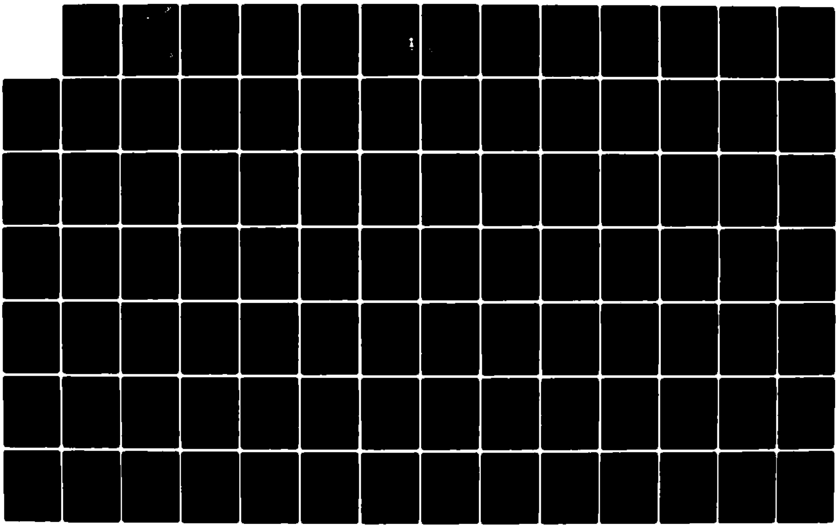

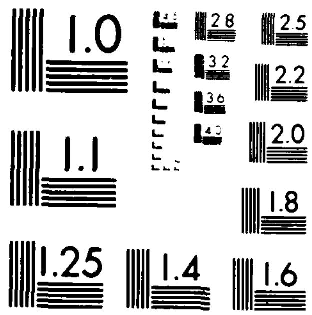

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A STUDY TO DEMONSTRATE THE
APPLICATION OF A GRAPHICAL METHOD
TO DETERMINE AN OPTIMAL
MAINTENANCE TASK INTERVAL
FOR AN ITEM IN AIR FORCE INVENTORY

Douglas C. Beckwith, Captain, USAF
Anthony R. Roclevitch, Captain, USAF

LSSR 60-82

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Determining maintenance task intervals is an important part of any scheduled maintenance program. Criteria for determining optimal intervals is usually based on an objective function designed to minimize average long-term (expected) cost. This study demonstrates a graphical method, developed by Bergman in 1977, for determining a maintenance task interval using the KT-73 Inertial Measurement Unit installed on the A7-D. The method establishes intervals on a "hard time" replacement policy, but can also be used under an "on-condition" maintenance policy. The authors sought to discuss this study within the context of the Reliability-Centered Maintenance Program, but to deviate from the traditional age exploration concept and cost-benefit analyses. Instead, Bergman's simple, but rigorous, method is employed to find a task interval based on a control strategy which balances cost of replacement with cost of failure and results in a minimum total long-run average cost per unit time. Among the advantages of Bergman's method are that the underlying failure distribution need not be known and that a sensitivity analysis can be performed to examine the effects of cost uncertainty with regard to changes in the optimal interval.

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A STUDY TO DEMONSTRATE THE APPLICATION OF A GRAPHICAL METHOD TO DETERMINE AN OPTIMAL MAINTENANCE TASK INTERVAL FOR AN ITEM IN AIR FORCE INVENTORY

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the Requirement for the

Degree of Master of Science in Logistics Management

By

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September 1982

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This thesis, written by

Captain Douglas C. Beckwith

and

Captain Anthony R. Roclevitch

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

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Captain Beckwith: I wish to express loving gratitude to my wife, Cindy, and daughter, Sarah, for their patience, understanding and selfless cooperation through the graduate program.

Captain Roclevitch: I dedicate my work to my wife, Sylvia, and son, Tony, whose love I could not do without, and for whom, I do everything.

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CHAPTER I

INTRODUCTION

Determining maintenance task intervals is an important part of any scheduled maintenance program. Criteria for determining optimal intervals are usually based on an objective function designed to minimize average long-term (expected) cost. Cost can be expressed in terms of dollars, availability, or readiness, to name a few. This study will demonstrate a graphical method developed by Bo Bergman in 1977 to determine an optimal maintenance task interval for an item in Air Force inventory.

A maintenance task is categorized into one of three recognized maintenance processes: hard time replacement, on-condition, or condition monitoring.

A "hard time" maintenance policy consists of establishing interval time periods of constant "T" at the end of which a unit is replaced, regardless of condition, as a means of precluding failure (1:5; 26:A2-3).

An "on-condition" maintenance policy consists of establishing interval time periods to inspect a unit for measurable wear with a decision to replace based on exceeding set limits (1:6; 22:51).

A "condition monitoring" maintenance policy does not require maintenance tasks. Under this policy, units not safety or economically significant are permitted to fail and are replaced when discovered (1:7; 22:66).

Bergman's method will be used in this study to determine an optimal task interval based on the hard time concept. The chief advantages of Bergman's method are that the method is simple, the underlying failure distribution need not be known, and the method can be used to analyze any maintenance item for which failure and cost data are available.

A great deal of theory exists on the subject of optimal maintenance policies (see Chapter II). This study attempts to apply some of that theory within the context of an existing maintenance program.

Terminology

Any discussion of maintenance task interval determination in the Air Force is fundamentally tied to Reliability-Centered Maintenance (RCM) concepts. Therefore, the following terms, used throughout this paper, are defined:

Actuarial Analysis: "Statistical analysis of failure data to determine the age-reliability characteristics of an item [22:453]."

Age Exploration: "The process of collecting and analyzing information from in-service equipment to determine the reliability characteristics of each item under actual operating conditions [22:453]."

Age Replacement: Replacement of a unit at failure or some specified age, whichever occurs first (25:139).

Decision Diagram: "In RCM analysis, a graphic display of the decision process in which the answers to an ordered sequence of yes/no questions lead to an identification of the appropriate maintenance action for an item without regard to appropriate level [22:455]."

Failure Modes and Effects Analysis (FMEA): "An analysis, initially performed by the equipment (aircraft) manufacturer, on all the major assemblies, subsystems and systems to demonstrate how the equipment will perform when various items fail [22:80]."

Failure Cycle: The time from renewal to failure of an item.

Item: "Any level of the equipment or its sets of parts isolated as an entity for study [22:459]."

Reliability-Centered Maintenance: "A logical discipline for developing a scheduled maintenance program that will realize the inherent reliability levels of complex equipment at minimum cost [22:463]."

Renewal: Restoring an item to a "good-as-new" condition.

Significant Item: "An item whose functional failures have safety or significant economic consequences [22:464]." The term "significant" is a subjective value assignment made through decision processes which are outside the scope of this study.

Task Interval: "The task interval assigned in a maintenance program, subject to adjustment on the basis of findings from actual operating experience through a process called age exploration [22:459]."

AFLC: Air Force Logistics Command

AFSC: Air Force Systems Command

AGMC: Aerospace Guidance and Metrology Center

DOD: Department of Defense

MDS: Mission-Design-Series

WUC: Work Unit Code

Background

Early aircraft were primitive, and redundancy was practically absent in aircraft design due to weight penalties. Consequently, maintenance programs attempted to preclude the failure of every part. The idea that a direct relationship existed between reliability and safety led to the belief that the more scheduled maintenance, the more reliable the aircraft. Thus, "hard time" replacement policy drove early maintenance programs (1:1-2). Aircraft components were replaced after a specified time which, by best estimates, would be before failure (22:51,65,370).

After World War II, advances in design, materials and manufacturing of aircraft began to erode traditional beliefs about the relationship between reliability and safety. The airline industry, during the 1950s, introduced new alternatives to "hard time" concepts. Eventually the process of inspecting against measurable standards became a second maintenance process. It would later be referred to as the "on-condition" process (22:383; 1:2).

During the 1960s, studies conducted by the airlines, technological advances, complexity of design, and the need to maintain more efficient and cost-effective maintenance programs eventually led to the recognition that certain items do not benefit from scheduled maintenance. This discovery resulted in the advent of a third maintenance process called "condition monitoring." Under this process, items are permitted to operate until failure. Maintenance tasks do not exist under this process (22:66; 1:7).

The introduction of the Boeing 747 aircraft with all of its complexities reinforced the need for new approaches to maintenance. Major airline operators and Federal Aviation Agency representatives formed a maintenance steering group (MSG-1) which developed a decision tree technique for determining maintenance requirements. The technique was refined, expanded, and published in a universal document called Airline/Manufacturer Maintenance Program Planning Document: MSG-2 in 1970. The fundamental concept behind the program was that maintenance actions can only prevent deterioration of the inherent design levels of equipment reliability (1:10; 22:Preface).

The objective of MSG-2 was to outline the organization and decision processes for determining scheduled maintenance requirements for new aircraft. In other words, the MSG-2 document would facilitate the development of initial scheduled maintenance programs (1:9).

As new airline programs based on MSG-2 decision logic began to grow, the Department of Defense (DOD) experimented with the program, beginning with the Navy P-3 aircraft. Believing that benefits could be derived from the MSG-2 program, especially in terms of manhour savings and increased equipment availability, the DOD between 1974 and 1978 issued several directives and memorandums to implement the "Reliability-Centered Maintenance Program (RCMP)" across all services (1:22-88).

Initially, the program did not address the problems of establishing task intervals, consolidating tasks into work packages, or making decisions where no information is available. These areas were addressed, but not resolved, later in an authoritative text by Nowlan and Heap entitled, Reliability-Centered Maintenance (22:Preface).

Nowlan and Heap wrote their text (1978) under contract to the Office of Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics. The text was intended to provide the necessary information to understand, develop and implement RCM programs (22:DD Form 1473). In general, RCM implementation for a given aircraft system consists of an initial failure modes and effects analysis (FMEA) for significant items, identification of tasks via use of the decision logic diagram, and determination of task intervals (22:7).

The first requirement above is satisfied initially by the builder of the airframe through Government contract. The second requirement is fulfilled on a continuing basis by the armed services (AFSC, AFLC in the Air Force) by modifying task requirements based on engineering analysis. The third requirement is discussed by Nowlan and Heap under the general heading of age exploration, but no method for determining optimal task intervals has been developed and published by the Air Force. Currently, Air Force engineers are using the Mean Time Between Failure (MTBF) and Incipiency methods. The MTBF method is

> . . . based on a 70 to 90 percent probability of detecting a pending failure. This is equivalent to inspection at 10 to 30 percent of the MTBF. An alternative method called the Incipiency Concept holds that the inspection interval should be a function of the time between first discernible degradation in performance and loss of the function [28:12].

There are also two computerized programs available (discussed in Chapter II), but they are designed primarily as program management tools.

The Army has published an Appendix C to DARCOM-P 750-16, <u>DARCOM Guide to Logistic Support Analysis</u>, which defines a general methodology for determining maintenance task intervals based on replacement cost, safety and readiness criteria, and equipment failure rates. The method uses age exploration and seeks to minimize cost, but it involves subjective trade-off considerations (33:C1-C44).

Frick and Sasser (1979) investigated a method to improve the preventive maintenance checks and services program for the M60A1 main battle tank. In the study, Frick and Sasser developed a questionnaire sent to operating units. Each question represented a variable, such as technician skill level, which was analyzed using multiple regression to establish correlations between type and time interval estimates for individual maintenance tasks. The results were subjected to network analysis to produce a preventive maintenance checks and services schedule (14:72-73). The research was extremely subjective since it sought opinions rather than substantive data.

Thus far, the Air Force has successfully integrated the majority, but not all, of its aircraft inventory into the RCM program through contract with the airframe builders. System Managers monitor and update programs using the decision logic criteria outlined in MIL-M-5096D and AFLCP 66-35. (A proposed AFSC/AFLC combined regulation is being drafted which will greatly expand AFLCP 66-35.) However, maintenance task interval determination remains an area without a proven applicable analytical technique.

Although RCM is a DOD program, each service is pursuing the program objectives individually. There is no apparent consistency of effort. The major problem seems to be lack of guidance from DOD which can best be characterized by the fact that DOD, despite its emphasis on implementing the RCMP within the services, has yet to define the program (1:84-85).

Justification for Research

The Air Force recently experienced a large incidence of failure of the fifth stage compressor disc for the J-85 engine (20:3). Attention to the problem was brought about by an aircraft accident. The aircraft accident board attributed the accident to failure of the disc and also discovered that the replacement interval for the disc had been changed by AFLC from the 3200 hours recommended by General Electric to 4000 hours. The disc failed less than 100 hours from replacement and resulted in the loss of the aircraft. Consequently, the replacement interval has been changed to 3600 hours (20:1-3). The board findings illustrate the need to develop a methodology for determining optimal maintenance intervals.

An excerpt from a HQ USAF Reliability-Centered Maintenance Program Status Report dated 29 May 1981, identifies an Air Force Logistics Management Center (AFLMC) tasking to pursue a means of improving the analytical process for determining scheduled maintenance task intervals during FY 82 and the outyears (19:4).

The latest effort by AFLMC was a contract study which resulted in a report authored by Singpurwalla and Talbott and published in January 1981. The report reviewed key ideas in the area of preventive maintenance replacement policies, and concluded that sufficient theory exists for practical applications (26:A2-16,17).

There is, indeed, much theory (see Chapter II) concerning optimal maintenance policies used to determine task intervals. The policies are typically based on the objective of finding the interval which minimizes cost. Bergman's method, the subject of this study, also seeks to minimize cost. However, as these methods are presented in theoretical form, application of the theory needs to be explored.

The MSG-2 maintenance concept did not address the problem of establishing task intervals (22:Preface). Any maintenance task can be made effective in terms of failure prevention if the intervals are made short enough, but this ignores, among other things, the opportunity cost of being unable to operate the equipment during maintenance (22:91,95).

Nowlan and Heap discuss maintenance task interval determination in terms of age exploration and actuarial analysis. Basically, intervals are established at an age when a large number of failures begin to occur, but before which very few failures occur (22:390). Approaching the problem of cost-effectiveness, they employ a decision logic technique. Specifically, they recommend at least four proposed intervals be examined to determine whether a cost-effective interval does exist, based on the most favorable cost-benefit ratio (22:102).

Their approach tends to suboptimize the last of the four objectives of an operator's maintenance program. Those objectives are

- To ensure realization of the inherent safety and reliability levels of the equipment.
- To restore safety and reliability to their inherent levels when deterioration has occurred.
- To obtain the information necessary for design improvement of those items whose inherent reliability proves inadequate.
- To accomplish these goals at a minimum total cost, including maintenance costs and the costs of residual failures [22:Preface].

Nowlan and Heap do not approach the problem of determining "optimal" intervals by balancing the cost of replacement and the cost of failure.

Perhaps a key word is "costs." Concerted efforts to assess benefits derived from implementation of RCM programs in DOD have generated controversy because of the difficulty in delineating cost-savings directly attributable to RCM and in quantifying benefits such as increased equipment availability (1:68-69).

An unending cycle exists in which appropriate cost data is not available to fully test new methods for determining maintenance task intervals, while on the other hand, the adoption of an acceptable methodology might warrant changes in data systems to facilitate collection of needed cost information.

Nevertheless, a need exists to begin bridging the gap between theoretical and practical application of methodology to determine maintenance task intervals.

Problem Statement

DODD 4151.16, AFR 66-14, AFR 66-30, AFLCP 66-35 and MIL-M-5096D provide definitions, outline responsibilities and explain the use of reliability data as applied to equipment maintenance, but the Air Force does not present a standard analytical approach for determining maintenance task intervals in published form.

Research Objective

The objective of this study is to demonstrate the feasibility of applying a new and simple graphical method for determining optimal maintenance task intervals using actual field data for equipment used on aircraft. The method is based on a control strategy which balances cost of replacement with the cost of failure resulting in a minimum total long-run average cost per unit time.

Research Question

Can Bergman's graphical method be applied in determining an optimal maintenance task interval based on the objective of minimizing total long-run average cost per unit time using actual field data?

Since the research question involves application of actual field data for an existing item in Air Force inventory, two questions secondary to the research question are

1. How does the calculated optimal interval for the units tested compare with the current interval for that item?

2. How sensitive is the calculated optimal interval to the uncertainty of cost?

Scope and Limitations

The Reliability-Centered Maintenance Program is a DOD program and applies to all military services. There are three basic steps for incorporating a major equipment end item into the program: (1) a failure modes and effects analysis (FMEA) for all significant items, (2) identification of maintenance tasks based on the decision logic, and (3) determination of maintenance task intervals. This study is concerned with the third requirement and is limited to its application in the Air Force, though results could be generalized to any equipment maintenance program. Bergman's graphical technique was chosen among the many available theoretical models because it is a simple, but rigorous method.

The units selected for the study were taken from the Air Force aircraft inventory of equipment primarily to facilitate data collection.

The unit selected for study was by no means an ideal one. The KT-73 Inertial Measurement Unit (IMU) is used on the A7-D and AC-130A aircraft. This study collected data for only those units installed on the A7-D. A complete description of the unit is contained in Appendix A. As an electronic component, the KT-73 IMU currently does not have a maintenance task interval assigned to it. Like other electronic units, the KT-73 is assumed to have an exponential failure distribution (16). Thus, the item is maintained under a condition monitoring or "fly-to-failure" policy. A hard time replacement policy is appropriate for those items which exhibit wearout characteristics for which an economic life-limit can be identified. A unit which is already maintained under a hard time replacement policy would better illustrate the application of Bergman's graphical method.

Availability of failure data dictated the choice of unit for study. Bergman's method requires the use of observational data. The KT-73 is repaired by the Aerospace Guidance and Metrology Center (AGMC) and tracked by serial number and field operating hours on the G078C Maintenance Data Collection System. Since no other data collection system could be found which provided the same type of nonaggregated data, the C078C was the logical choice. The KT-73 was selected among other IMUs because of early acquisition.

The greatest limitation on this study centers around the availability of appropriate cost data. In order to find an optimal replacement interval which minimizes cost, the cost to replace an item (scheduled maintenance) as well as the cost of an in-service failure (unscheduled maintenance) must be known. These costs are actually random variables, not constants. Since Bergman's method treats these costs as constants, an expected value for each cost will be used in lieu of a probability distribution description. Furthermore, since the cost data covers several years, it is assumed that these historical costs are representative of actual costs.

The cost of in-service failure can be obtained from data collected by the Resources Division at AGMC and is expressed in terms of the actual dollar amount required to repair each failed unit. Adding to this, the cost of transporting units to and from depot and the cost of labor to trouble-shoot failed units gives the total cost of failure.

Replacement cost is the cost of transporting units to and from depot plus the cost that would be incurred to renew a nonfailed unit which is removed after a specified interval of time, presumably before failure. This entails repair or replacement of unit subcomponents which are approaching failure, thus, restoring the unit to a "good-as-new" condition (renewal) (24:53). Since the KT-73 IMU is a hermetically-sealed unit, any unit received by AGMC, whether failed or nonfailed, is subjected to the same test and repair procedures (Appendix A contains a checklist used for testing units)(16). Consequently, the same cost is incurred to repair a nonfailed unit as a failed unit.

The difference between cost of replacement and cost of failure is the cost of trouble-shooting. Other costs which could be considered are the loss of equipment availability or readiness. But these costs are much too difficult to quantify.

Actual cost to repair a failed unit is documented as an annual average for each fiscal year. Transportation costs are documented quarterly by WUC 73FAO in the K051 system. By adding the repair cost, transportation cost and trouble-shooting cost, a total cost of in-service failure can be assigned to each unit in the sample. The range of these values can be evaluated for parameters and used for sensitivity analysis under Bergman's method. A limitation exists in that individual trouble-shooting costs cannot be linked to individual unit failures by serial number. Cost data provided by AGMC and the K051 data collection system is presented in aggregated form from which averages (expected costs) must be derived.

It should be noted that a unit might have failed in a quarter previous to the one in which it arrived at and was repaired by AGMC. In cases where this is true, the costs of transportation and trouble-shooting for a unit may be included in a different quarter than the quarter in which the repair cost for the same unit is recorded. However, since expected per unit costs in this study are computed based on annual averages, the problem is limited to when the discrepancy occurs between the last quarter of a given year and the first quarter of the following year. Hence, the use of annual averages tends to smooth or reduce the scope of the mismatch problem.

Since in-service failure of the KT-73 will not cause a mission abort or damage to other components in the system, an attempt will not be made here to quantify the effects of aircraft Not-Mission-Capable (NMC) time generated by failure of the KT-73 unit. This kind of opportunity cost (the cost of being unable to operate the aircraft) is contingent on too many variables to attempt an adequate measure. To illustrate this difficulty, a Government Accounting Office (GAO) study in November 1976, an Air Force Audit Agency (AFAA) audit in April 1977, and an Air Force study in November 1977 sought to measure benefits derived from RCM using the same kind of variables. General comments from these reports concluded that ". . . RCM appeared to have had an effect that could not be quantified [1:68]."

The validity of the findings of this study is dependent on the accuracy of the data contained in the G078C and K051 systems. Inaccuracies in the data are probably the most often cited shortcoming of the entire range of maintenance data collection systems (3:12). Badalamente and Clark (1978) discuss these and other problems in their technical report. The advantage in using data collected from the G078C is that operating hours are tracked by a mechanical time indicator as opposed to being tracked by manual observation.

Methodology

The objective of this study is to demonstrate the application of Bergman's graphical method for determining optimal maintenance task intervals. To accomplish this, field data for the KT-73 Inertial Measurement Unit representing operating time to failure, replacement cost, and cost of in-service failure will be collected from the G078C and K051 Maintenance Data Collection Systems. The failure data will be scaled and used to construct a Total Time on Test (TTT)-plot representing a transform of the empirical failure distribution for the unit. The cost data will be scaled and used to plot a point, which represents the cost of replacement, through which a line can be drawn tangent to the TTT-plot. The abscissa of the tangent point denotes the index for the optimal replacement interval.

The function that Bergman's method performs is to minimize total long-run average cost per unit time, C(T), by maximizing the reciprocal of the objective function, $[C(T)]^{-1}$.

The calculated interval can be compared to the existing interval, which is infinite (fly-to-failure), and a sensitivity analysis performed using a range of values for cost of replacement to observe their effect on changes in the optimal interval.

Research Assumptions

1. Units upon which data are collected are subjected to identical and constant maintenance policy.

2. Field data was accurately entered into the G078C and K051 Maintenance Data Collection Systems.

3. The replacement cost provided by AGMC is a valid estimate of long-run average cost to replace.

4. The item used in this study is not safety-critical.

5. Organizations operating the units under study consider the effect of a unit's failure on mission in the same way. Essentially, the effect which the unit has on aircraft status in the Mission Essential Subsystems List (MESL) is the same. For example, if the anti-skid system on a T-39 aircraft is not operational, all units would record the aircraft status as Partial-Mission-Capable (PMC). This

assumption is necessary since the priority given to failure of a KT-73 unit could affect base labor costs.

CHAPTER II

LITERATURE REVIEW

Introduction

> For over two decades, there has been a large and continuing interest in the field of reliability and maintainability concerning maintenance models for items with stochastic failures. This interest has its roots in many military and industrial applications [23:353].

As Pierskalla and Voelker point out in their survey paper, there are a number of maintenance models. This review is concerned with those models which pertain to the maintenance of simple (i.e., single component) equipment and which involve an optimal decision to replace a unit in service (scheduled, hard time maintenance). These types of maintenance policies are known as "Replacement Policies" and involve the single uncertainty of when a failure will occur (26:A2-1).

The maintenance models presented here address objective of minimizing total cost or maximizing availability. In addition to the optimal concepts presented, the U.S. Army's use of age exploration (in determining hard time replacement intervals) as well as two computer-assisted maintenance programs are discussed. The literature has been divided into the three sections indicated in Figure 2-1.

I. Optimal Replacement Policies

A. Age replacement

B. Block replacement

C. Periodic replacement with minimum repair at failure

D. Sequential replacement over a finite time span

E. Optimal replacement under damage accumulation model

II. Age Exploration

III. Computer Assisted Maintenance Programs

Fig. 2-1. Summary of Preventive Maintenance Literature

Discussion

Optimal Replacement Policies

This section considers policies pertaining to scheduled maintenance actions on a hard time replacement basis so as to preclude failure during operation. These policies specify a replacement interval, T, which minimizes total long-run average cost per unit of time, C(T).

Age Replacement. In general, an age replacement policy is in effect when a part is replaced at failure or at some specified age, whichever occurs first (6:85; 18:213; 7:751). This policy makes intuitive sense only if the cost of replacement is less than the cost of an in-service failure and only if all costs are nonnegative (6:85; 18:213; 7:751).

According to Barlow and Proschan, the specified decision variable, age of replacement (i.e., T), can be random (for a finite time span) or fixed (for an infinite time span) (6:72,86). Most of the age replacement literature is for an infinite time span, whereby, the underlying failure distribution is assumed to be known and continuous, the optimum age replacement interval is a constant, a replacement restores the system to a good-as-new condition, and the restoration process goes on indefinitely (6:86).

Ingram and Scheaffer assert that if the underlying failure distribution is completely known, then finding the optimum replacement interval is simply an analysis problem (18:213). However, if the underlying distribution is not completely known, they show that an estimate of the optimum interval, T, can be found by minimizing a consistent estimator, $C_n(T)$, of the objective function C(T). The consistent estimator, $C_n(T)$, assumes a form or property of the failure distribution. They treat four cases: (1) a Weibull distribution with unknown scale parameter, (2) a gamma distribution with unknown scale parameter, (3) an empirical distribution, and (4) a distribution specified only as having an increasing failure rate (18:213). They conclude that the empirical estimator of the optimum replacement interval is close to the estimators of the cases in which the distribution is known (18:219).

Berg notes that previous authors have assumed that an age replacement policy is appropriate for a replacement scenario. In his paper (7:751-759), he proves that an age replacement policy is the optimal procedure among a range of replacement policies for which a replacement time can be well-defined (7:752). He accomplishes this by showing that the expected long-run cost per unit time for an optimal age replacement policy is less than or equal to the expected cost associated with other common replacement policies (7:758).

Scheaffer introduces an optimal age replacement policy with an increasing cost factor for an infinite time horizon. Specifically, he addresses the exponential life distribution with an exponential cost factor (25:142), i.e., the cost of replacing a unit increases with age. For example, the trade-in value of a rubber tire may decrease with wear. This has the effect of increasing the cost of replacement with age. Using numerical illustrations, he shows that when the objective function includes an increasing cost factor, the optimum replacement interval yields a smaller average cost per unit time than the interval found under a replacement policy whose objective function does not include an increasing cost factor (25:144).

According to Glasser, the analytical solution for finding the optimal age replacement interval is generally known (15:83). In his paper, he asserts that the optimal interval depends upon: (1) the ratio of cost of failure to cost of replacement, and (2) the average service life in standard deviation units (15:86). For the truncated normal, the gamma and the Weibull distributions, he charts cost ratio versus service life for each case to obtain a graphical means for locating the optimal replacement interval based on changing values for the two variables (15:87-89).

Fox considers a discounted cost criterion when determining an optimal age for replacement. Assuming a continuous IFR failure distribution, he shows that for each stage (replacement to replacement) on an infinite time span, there is an optimal replacement interval which minimizes loss (12:534). For example, if a replacement interval is fixed at age T and a failure occurs before age T, then a loss is incurred. Fox seeks to find an optimal interval which minimizes this loss (12:534-535).

Block Replacement. Barlow and Proschan define a block replacement policy as one in which an item is replaced at equal time intervals independent of age and at failure (6:67). This policy has the practical advantage of not having to maintain records of failure times or age. When compared to an age replacement policy, block replacement results in a greater number of total removals. However, the expected number of failures is fewer under block replacement, provided failure increases with age (6:67). The objective is to minimize average cost per unit of time.

Berg and Epstein acknowledge that block replacement policies (BRPs) result in the replacement of fairly new items. Some modifications to the BRP have been made to avoid this drawback. One model allows minimal repair of a failed item which is equivalent to replacing the item with a working one of the same age (8:15). Another model permits a failed item to remain idle until scheduled block replacement occurs (8:16). They propose a third model called a Modified BRP.

In Berg and Epstein's Modified BRP, failed items are still replaced immediately, but items of age "b" or less are permitted to remain in service when a scheduled block replacement point arrives. Within the interval (O,t), there is an age b such that $O<b<t$. The objective function, C(b,t) is then minimized for values of b and t (8:16-17).

Singpurwalla and Talbott point out that, although the problem of replacing relatively new items is overcome, an additional problem is created by requiring knowledge of an item's age (26:A2-13).

Periodic Replacement with Minimum Repair at Failure. Barlow and Hunter developed Policy II, a variation of the block replacement concept. Under this policy, system replacement occurs at a fixed time, regardless of the number of previous failures. For failures which occur prior to planned replacement, only minimal repairs are made so that the system failure rate is unchanged (5:92). "This repair action is mathematically equivalent to replacing the failed item by another working item of the same age [8:15]." Under this policy, complex systems appear to be single units aging over time.

Sequential Replacement Over a Finite Time Span. In a sequential replacement policy where an item has a finite life, replacements are scheduled only for the next interval such that the next planned replacement time is found which minimizes expected cost over the remaining life of the system (6:98). Hence, a new optimal replacement time is computed after each replacement rather than at fixed time intervals. Barlow and Proschan compared the results of a sequential policy versus an age replacement policy and found that the difference was quite small (about one percent of expected cost) (6:105). Their work was reviewed by Singpurwalla and Talbott who stated, "Only in cases of very high maintenance costs should sequential replacement policies be considered [26:A2-15]."

Optimal Replacement Under Damage Accumulation Model. Taylor presents an optimal replacement policy based on additive damage which seeks to balance the cost of replacement with the cost of failure, and which results in minimum total long-run average cost per unit time (29:1). The damage accumulation model uses a shock failure model in which shocks to the system occur in a Poisson fashion and accumulate additively. The total accumulated damage dictates the probability of system failure (29:4). Assuming that the accumulated damage can be continually observed by a controller, a decision to replace can be made based on the current value of total damage (29:2). Taylor shows that an optimal policy exists which enables the controller to replace the system upon reaching a critical damage threshold. Replacement also occurs upon failure, regardless of the amount of damage, and a penalty cost is incurred (29:5).

Singpurwalla and Talbott conclude that models of this type have limited usefulness because they are highly structured and require a great deal of user information (26:A2-15).

Age Exploration

Nowlan and Heap's concept of age exploration (discussed in Chapter I) considers cost measurement subjectively without giving a truly optimal method for determining maintenance task intervals. Although the U.S. Army uses this concept for determining hard time replacement intervals, the procedure below must be considered outside the context of "optimal" age replacement policies.

Essentially, the Army establishes two types of hard time limits: safety and readiness. In each case, a cumulative failure distribution is first established (or assumed) for the item under study. For safety limits, replacement intervals are established based on extremely low probabilities of failure. Readiness hard time intervals are established for items which affect mission success. The readiness interval is identified through a trade-off process involving the cost of replacement, the cost of failure and the readiness requirement of the equipment under consideration (33:C6-C19). Although an objective function is formulated, the trade-off process actually represents a "search" process for an acceptable, rather than an optimal, solution.

Computer-Assisted Maintenance Programs

The Computer Monitored Inspection Program (CMIP) developed by Lockheed, and the Vought RCM Update System developed by LTV Corporation are designed to help managers keep scheduled maintenance programs current and cost-effective while maintaining design levels of safety and reliability. They are similar in that both programs use a series of computer routines to reduce data collected by the Air Force. These programs are currently in limited use by the Air Force for determining intervals for scheduled maintenance programs and are projected for widespread use on many MDS aircraft.

Essentially, the program outputs are designed to provide analysts and decision makers with the information necessary to evaluate maintenance task requirements. Decisions can be made whether to add or drop certain maintenance tasks and whether or not to change task intervals. Additionally, information is provided concerning the effects of these changes on associated manhours (17:29; 19:4).

The programs differ primarily in output. The CMIP output is more condensed than the Vought output and was designed as an exception report which makes recommendations to the manager about changing requirements. The Vought program output provides considerably more information designed for the analyst's use. It does make recommendations, but it provides enough information to permit in-depth analysis for trends in changing requirements. For this reason, the CMIP is more applicable to aircraft with well-screened maintenance programs; i.e., multi-engine aircraft with numerous redundant systems. On the other hand, the Vought program is more applicable to fighter-type aircraft (17:17).

Both programs recommend changes in maintenance task intervals based on a "target probability" of having no malfunctions occur between scheduled maintenance for the item being considered. Once the target probability is established, an exponential failure distribution is assumed and an interval is calculated. The Vought program uses a fixed 85 percent target probability while the CMIP permits input of user-controlled target probabilities (17:31; 19:12). Although the programs refer to calculated intervals as "optimum" ones, the objective is not that of minimum cost or maximum availability. Cost considerations are treated separately from intervals and are limited only to evaluation of associated manhour requirements.

Summary

This chapter has examined the literature on maintenance policies designed to establish hard time replacement intervals. Pertinent information was provided concerning optimum replacement policies, Nowlan and Heap's notion of age exploration and computer-assisted maintenance programs to lay a basic framework for the research project.

The literature authored by Berg, Ingram and Scheaffer; Barlow and Campo; Bergman; and Singpurwalla and Talbott greatly influenced the direction of this project. Berg's paper shows that an age replacement policy is the optimal decision rule among all reasonable replacement policies. Research conducted by Ingram and Scheaffer presents a method of determining an estimate of the optimum age replacement interval where an empirical distribution function may be used with no serious loss of information. Barlow and Campo originally introduced the TTT-plot technique that Bergman later uses.

Bergman's research adds to the efforts of Ingram and Scheaffer, and Barlow and Campo, and derives a graphical technique used to obtain an estimate of the optimum age replacement interval. This technique provides an easy method to perform sensitivity analysis with respect to often uncertain cost. It has advantages in application in that it uses an empirical failure distribution versus an assumed/ theoretical failure distribution, and provides some intuitive feeling for the uncertainties involved in the estimation. Singpurwalla and Talbott concluded that among the age replacement policies, Bergman's graphical technique was the most promising because of its ease of application and theoretical correctness.

However, they cautioned that ". . . data over a limited time span, may not adequately represent the true failure distribution thereby introducing sampling error [26:A2-10]." Large samples are necessary for application of the method.

Because of the above stated reasons, it was decided that this research project would focus on Bergman's graphical technique.

CHAPTER III

METHODOLOGY

The objective of this research is to demonstrate that Bergman's method can be used to determine optimal maintenance task intervals based on a control strategy which balances cost of replacement with the cost of failure and results in a minimum total long-run average cost per unit time. To accomplish this objective, field data for a given piece of equipment will be analyzed using a Total Time on Test (TTT)-plot originally introduced by Barlow and Campo (1975) and presented in simple form by Bergman. Under this method, the life distribution is assumed to be unknown and observational data are provided (9:468). Once the data is analyzed, a graphical method is applied to obtain a reasonable nonparametric age replacement policy.

It should be noted that Bergman's method to obtain an optimal age replacement policy provides "hard time" intervals for scheduled rework or discard tasks.

The explanation of the methodology used in this research involves a discussion of cost measurement, TTT-plot, graphical solution, sensitivity analysis, sample space and data collection.

Cost Measurement

For any unit which is believed to be more prone to failure with age, it may be beneficial to replace the old unit with a new one at some point in time. Under an age replacement policy, maintenance tasks are scheduled at intervals. To find the optimal interval requires balancing cost of replacement (scheduled maintenance) with cost of failure (unscheduled maintenance).

For any age replacement policy, there is a cost of replacement (nonfailed item), C_o, and cost of in-service failure, C_o+k, where k represents the difference between the cost of replacement and the cost of failure. Therefore, an age replacement policy is advantageous when $(C_o+k) > C_o$.

Bergman expresses cost, C, as a constant which is equal to the cost of replacement standardized to units of k dollars. Thus, if

C_o = actual cost of replacement in dollars

C_o+k = actual cost of failure in dollars

Then for all positive C_o and k,

$C = C_o/k$, the standardized cost of replacement

$C+1 = C_o/k + k/k$, the standardized cost of failure

To illustrate, let C_o = \$100, and k = \$200, then C_o+k = \$300. Since $C = C_o/k$, then $C = 100/200 = 0.5$ is the cost of replacement in terms of k dollars. $C+1 = 1.5$ is the cost of failure.

In terms of Bergman's graphical technique, the cost of replacement, C, is a fixed value.

Total Time on Test-plot: Analysis of Failures

In arriving at an optimum age replacement policy, the underlying failure distribution, F(T), must be known and often, when the distribution is unknown, assumptions are made. Arunkumar (1972) attempted to resolve this problem by estimating the distribution using ordered failure time data (26:A2-5):

$$X_1 \leq X_2 \leq \cdots \leq X_n$$

Bergman simplifies Arunkumar's procedure and applies it to the TTT-plot technique. Given n lifetime observations $(t_1,\ldots,t_n)$, which are ordered according to size, the ith observation, t_i, represents the operating life for the ith unit. Then, total time on test through the ith failure time is calculated as

$$T_i = \sum_{j=1}^{i} = (n-j+1)\ (t_{(j)}-t_{(j-1)}),\ i = 1,\ldots,n$$

where $t_{(o)} = 0$. T_i is the total time generated by the n units before age $t_{(i)}$.

The ratio T_i/T_n, i = 1,...,n is the scaled total time on test at age T_i denoted by U_i, i.e., $U_i = T_i/T_n$. The TTT-plot is obtained by plotting U_i against i/n. The result is a function of an empirical cumulative distribution function, $F_n(T)$.

The following example illustrates the process for constructing a TTT-plot. Given that 10 units are observed to failure, the life times ($t_{(i)}$) are scaled as follows:

i	$t_{(i)}$	T_i	U_i
1	10.8	108.0	.3397
2	18.5	177.3	.5577
3	27.9	252.5	.7943
4	30.0	267.2	.8405
5	31.1	273.8	.8613
6	35.1	293.8	.9242
7	40.2	314.2	.9884
8	40.6	315.4	.9921
9	41.7	317.6	.9991
10	42.0	317.9	1.0000

A FORTRAN Program (Figure 3-1) will calculate values for T_i and U_i reading from the data tape (identified as Tape 11), and will output results in tabular form (Table 3-1).

Figure 3-2 shows the TTT-plot for the sample data. If the failure rate is an increasing function of age (IFR), the plot is concave. If the failure rate is decreasing, the plot is convex. If the failure rate is constant, the plot is a 45-degree slope. Figure 3-3 illustrates the three possibilities.

Nonparametric Age Replacement

Bergman's method is a mathematical representation of a stochastic process known as a renewal process (when an

```
      PROGRAM TTTPLOT
C
      REAL Y(100),T(100),U(100)
      INTEGER I,J,K,N,X
C
C     DEFINITIONS:  TAPE11 CONTAINS ALL
C     OBSERVATIONS SMALL T(I)
C     N=TOTAL NUMBER OF OBSERVATIONS PLUS ONE
C     Y(I)=CAPITAL T(I), U(I)=U(I), I,J,K,X
C     ARE INDEXES.
C
      N=11
      K=1
C
      DATA Y,T,U/300*0.0/
C
      READ(11,*)(T(X),X=2,N)
      PRINT'(1X,13X,"I",6X,"OBSERV",5X,"TOTAL",5X,"SCALED")'
      PRINT'(1X,12X,"NO.",6X,"TIME",6X,"TIME",7X,"TIME",/)'
C
      DO 10 I=2,N
           J=I-1
           Y(I)=(N-J)*(T(I)-T(K))+Y(K)
           K=K+1
   10 CONTINUE
C
      J=1
      DO 20 I=2,N
           U(I)=Y(I)/Y(N)
           PRINT 40,J,T(I),Y(I),U(I)
           WRITE(12,'(" ",F8.5)')U(I)
           J=J+1
   20 CONTINUE
C
   40 FORMAT(1X,12X,I3,5X,F6.1,4X,F6.1,5X,F6.4)
      RETURN
      END
```

Fig. 3-1. Program for Scaling Observed Data

TABLE 3-1

PROGRAM OUTPUT

I NO.	OBSERV TIME	TOTAL TIME	SCALED TIME
1	10.8	108.0	.3397
2	18.5	177.3	.5577
3	27.9	252.5	.7943
4	30.0	267.2	.8405
5	31.1	273.6	.8613
6	35.1	293.8	.9242
7	40.2	314.2	.9884
8	40.6	315.4	.9921
9	41.7	317.6	.9991
10	42.0	317.9	1.0000

END TTTPLOT

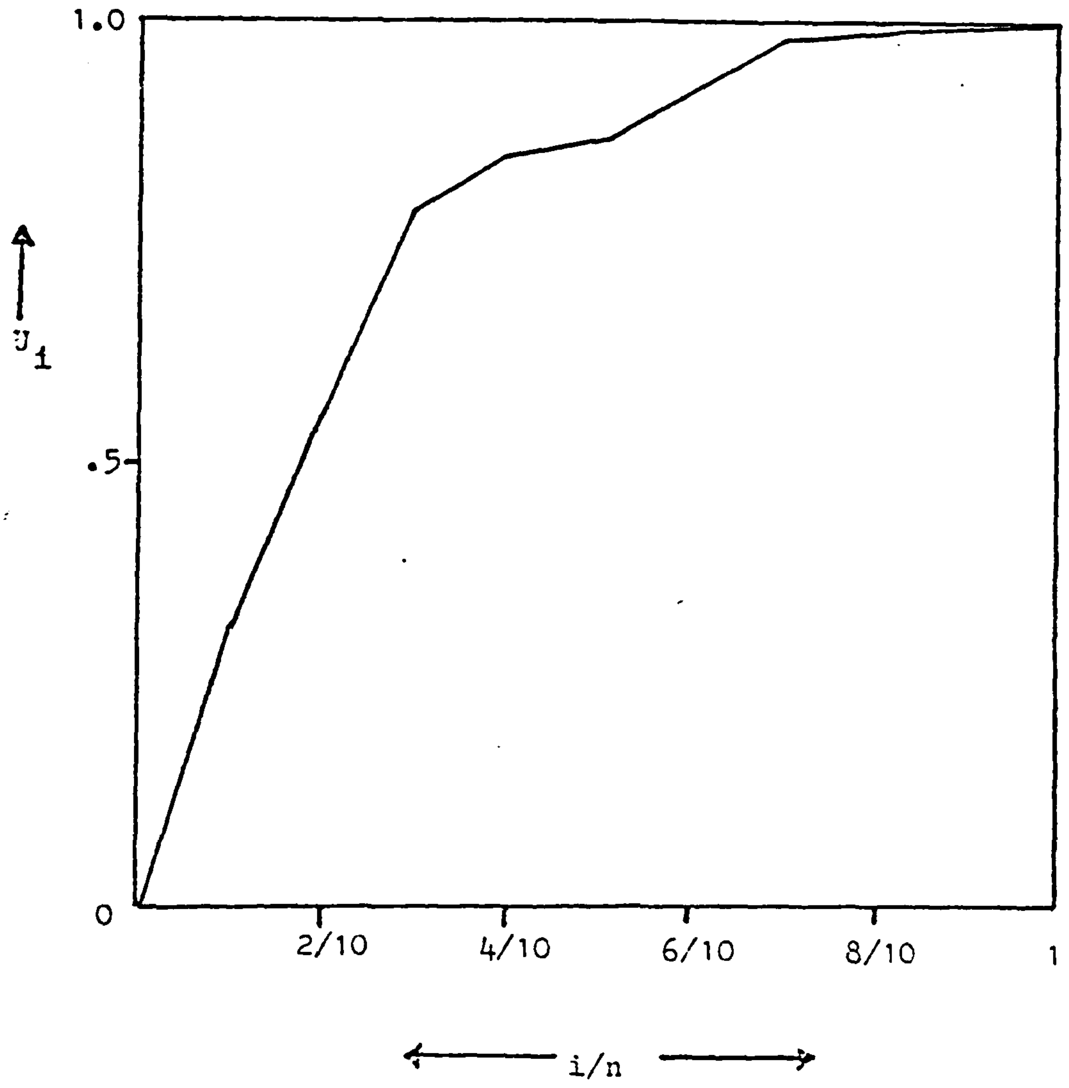

Fig. 3-2. TTT-plot

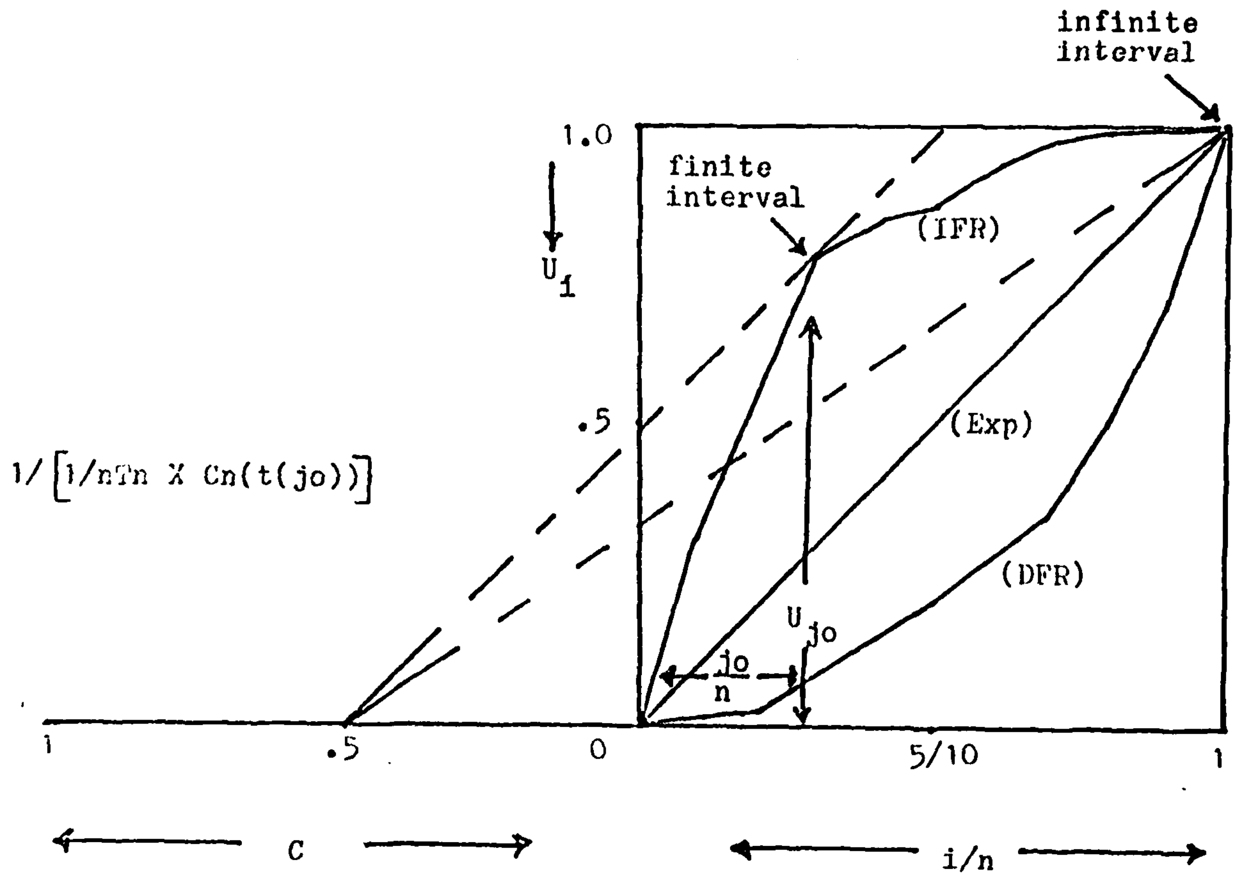

Fig. 3-3. Examples of Empirical Distributions

item is failed or replaced, the cycle starts over again). When rewards or costs (negative rewards) apply, the renewal reward theorem (24:53) states:

$$\text{average long-term cost} = \frac{\text{expected cost in a cycle}}{\text{expected cycle length}}$$

In order to minimize average long-run cost, the objective is then,

$$\text{MIN} \left[\frac{\text{expected cost/cycle}}{\text{expected cycle length}}\right]$$

This can be expressed as follows (9:467) (for $T \geq 0$):

$$\text{MIN} \quad C(T) = \left[\frac{C+F(T)}{\int_0^T (1-F(t))\,dt}\right] \qquad (1)$$

Thus, in finding an estimate of the optimal age replacement interval, a value for T must be found which minimizes cost C(T). Using the empirical life distribution,

$$F_n(t) = (i/n)$$

that is, substituting $F_n(T)$ for F(T) in Equation (1), then:

$$C_n(T) = \left[\frac{C+F_n(T)}{\int_0^T (1-F_n(t))\,dt}\right] \qquad (2)$$

Relying on a proof presented by Ingram and Scheaffer (18:216), Bergman states that to estimate the optimal age replacement interval, it is enough to find the index for t, call it j, with minimizes

$$C_n(t_j) = \left[\frac{C+F_n(t_j)}{\int_0^T (1-F_n(t))\,dt} \right] \tag{3}$$

Using the definition of the empirical distribution function $F_n(t_j) = j/n$ and the fact that $\int_0^T (1-F_n(t))dt = 1/n(T_j)$, $j = 1,\ldots n$

then, Equation (3) becomes

$$C_n(t_j) = \frac{C+j/n}{1/n(T_j)} \tag{4}$$

By manipulation,

$$\frac{C+j/n}{1/n(T_j)} = \frac{C+j/n}{1/n(T_n)(T_j/T_n)} = \frac{C+j/n}{1/n(T_n)(U_j)}$$

Thus,

$$C_n(t_j) = \frac{1}{1/n(T_n)} \left[\frac{C+j/n}{U_j}\right]$$

where T_n and U_j, $j = 1,\ldots,n$, are defined under the TTT-plot.

One way to minimize the discrete function $C_n(t_j)$ is by complete enumeration, but with large numbers of failures, enumeration is tedious. Bergman's graphical approach seeks to minimize C(T) by maximizing its reciprocal $[C(T)]^{-1}$.

Therefore,

$$\frac{1}{C_n(t_j)} = 1/n(T_n) \left[\frac{(U_j)}{C+j/n}\right]$$

Since (1/n(Tn)) is a constant determined from the discrete sample, to maximize $1/C_n(t_j)$ is to maximize $(U_j/(C+j/n))$. Moreover,

$\frac{1}{C_n(t_j)}$ is proportional to $\frac{1}{1/n(T_n)(C_n(t_j))}$ which is

equal to the slope of any line passing through the point (-c,0) and some point on the TTT-plot (Figure 3-3). Recall from earlier discussion that C is a calculated, fixed, scaled value for cost, and that

$$\frac{1}{(C_n(t_j))} \text{ is proportional to } \frac{U_j}{C+j/n} .$$

So to maximize $(1/C_n(t_j))$ is to maximize $(U_j/C+j/n)$ and is to maximize slope $[1/(1/n(T_n))(C_n(t_j))]$. More specifically (refer to Figure 3-4), in order to maximize

$$\frac{U_j}{C+j/n}$$

U_j in the numerator must be made as large as possible (Y-axis on the graph) and j/n in the denominator must be made as small as possible (X-axis on the graph). Cost C in the denominator is a fixed value. By constructing the line through the point (-c,0) tangent to the TTT-plot, the reciprocal $[C_n(t_j)]^{-1}$ of the objective function is maximized and the objective function $C_n(t_j)$ is minimized. The value j_o/n is the abscissa of the tangent point and j_o denotes the index of the optimal age replacement interval.

Using earlier cost and TTT-plot examples, a graphical solution for an optimal replacement interval is in Figure 3-4. For this example, the abscissa of the tangent point is $j_o/n = 3/10$. Hence, the optimal index, j_o, for the replacement interval is 3. Referring to Table 3-1, the value of t_i (observed time) for the third interval is 27.9 hours. The optimal replacement interval for this example is 27.9 hours. Again, the preciseness of this estimate improves with larger samples. It becomes evident that a finite replacement interval can only be obtained with an IFR distribution since a tangent drawn to a DFR or exponential distribution results in an infinite interval. The decision in the latter two cases would be not to replace.

Sensitivity Analysis

Though Bergman's method is based on calculation of a fixed cost C, a sensitivity analysis on cost can be performed.

A researcher may consider a range of values for C, for example, c+e, where c is an estimate of cost and e represents error within a specified interval. By locating the points (-c,0), (-(c-e),0), (-(c+e),0) and drawing lines through these points tangent to the TTT-plot, a range is

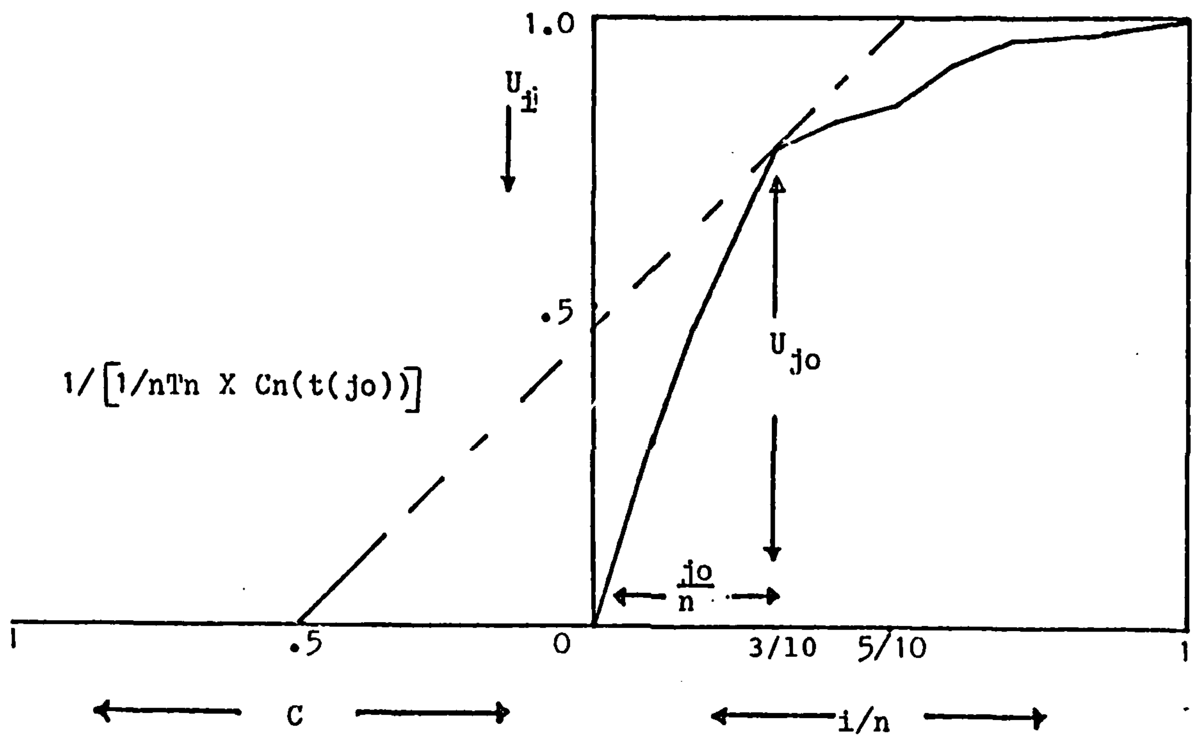

Fig. 3-4. Graphical Solution

constructed about the optimal replacement interval index ($j_1 \geq j_0 \geq j_2$) shown in Figure 3-5. In this example, $j_1=j_0=j_2$.

To illustrate further, for an IFR distribution, if (-(c+e),0) is close to (0,0), then the optimal index, j, will be small. This suggests that units should be replaced more often when the difference between cost of replacement and cost of failure is large (c is small). The difference then, must grow smaller as (-(c-e),0) moves away from the origin. But the effect of cost on changes in the index j is also dependent upon the shape of the TTT-plot. Figure 3-6 shows that as an IFR distribution becomes more concave, the optimal index j becomes less sensitive to cost. As an IFR distribution becomes less concave, the optimal replacement interval becomes more sensitive to cost.

Performing sensitivity analysis with actual data requires collecting cost data as described in a later section for each in-service failure used in this study. The data will be analyzed using the Statistical Package for the Social Sciences (SPSS) condescriptive computer routine to identify the cost estimates from the sample. The objective of the analysis is to examine the effects of changes in cost C with regard to the index j for the optimal replacement interval.

The Sample

Selection of a piece of equipment to use was a difficult choice. The KT-73 Inertial Measurement Unit

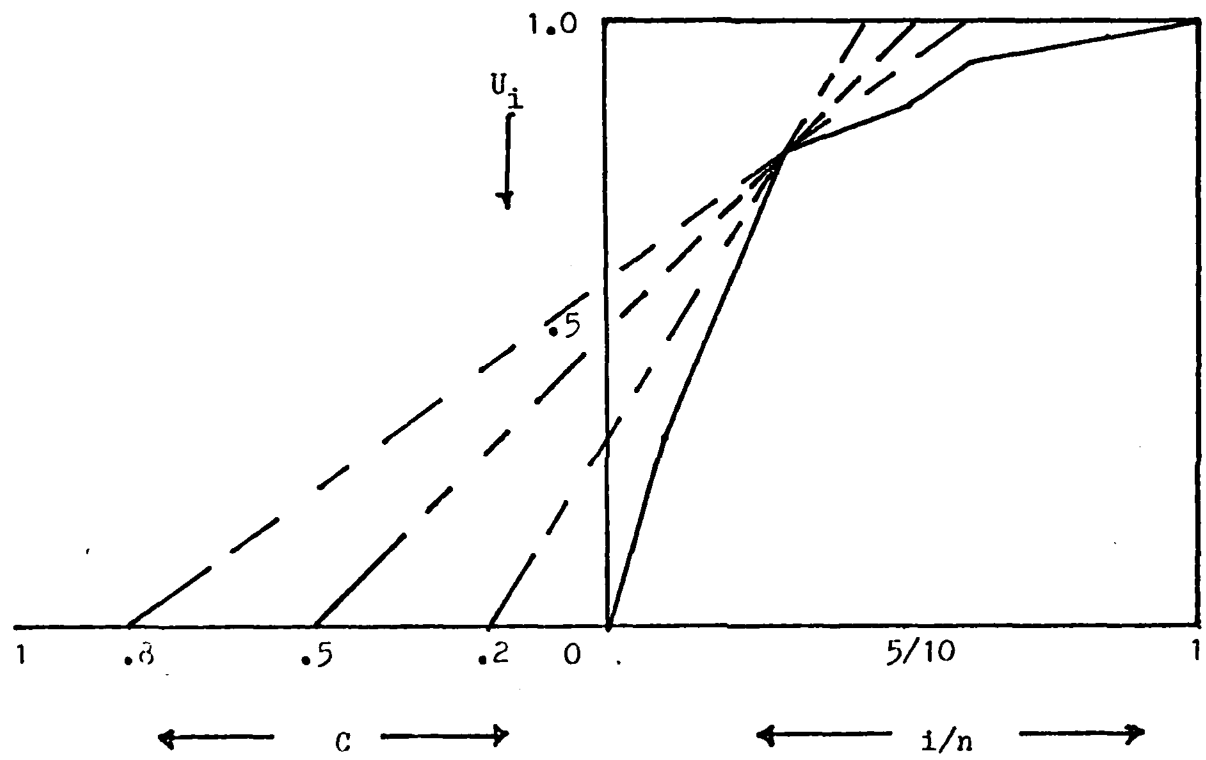

Fig. 3-5. Sensitivity Analysis

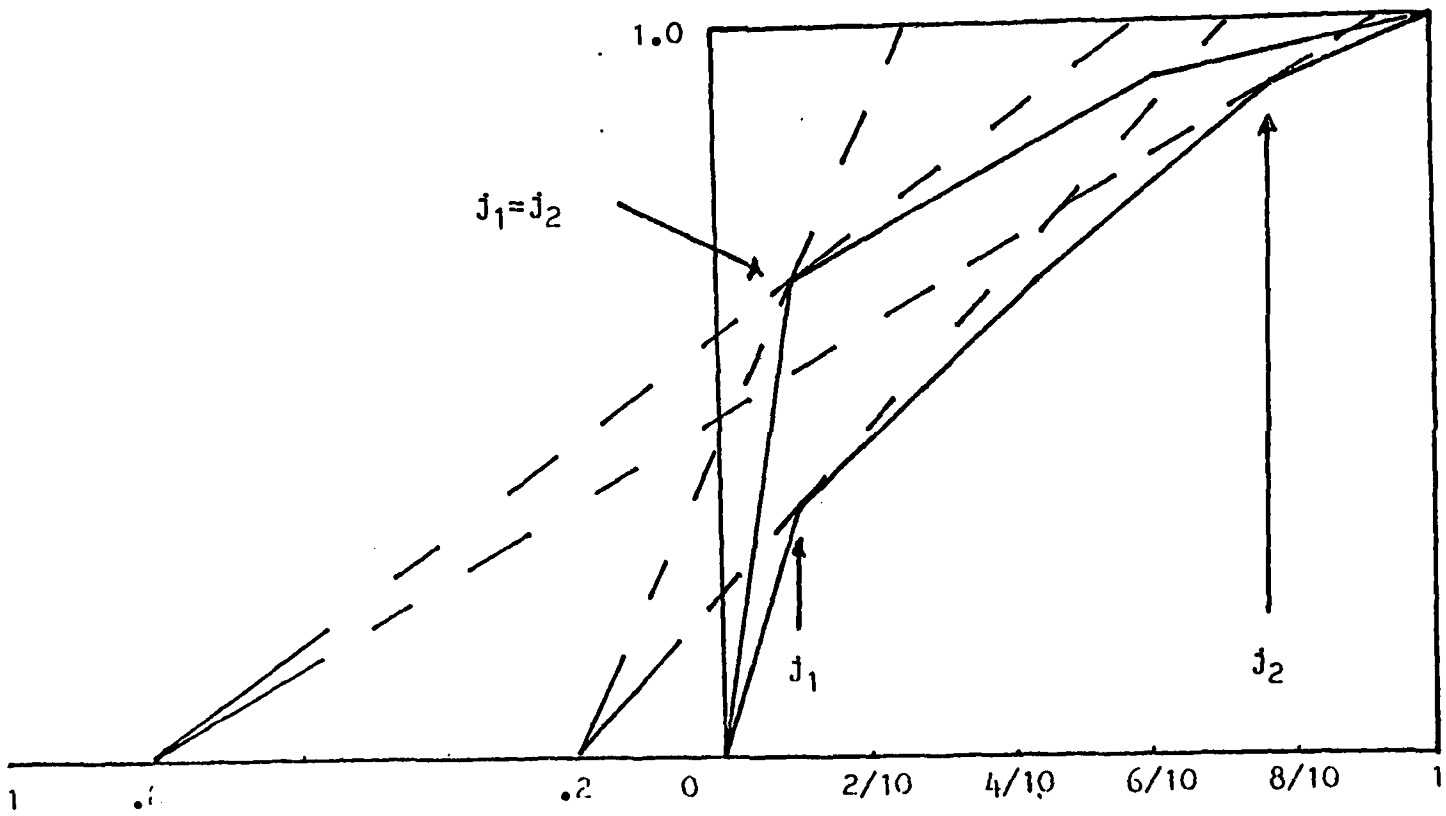

Fig. 3-6. Effects of Shape of Failure Curve on Sensitivity

used on the A-7D aircraft was chosen based on the following considerations:

Consideration A: In Chapter I, attention was given to expectations concerning available cost data. This study requires data for cost of replacement and cost of in-service failure. Since the cost to remove and replace a KT-73 IMU from an aircraft would be the same for both failure and non-failure, this cost is ignored.

The cost of in-service failure must be the sum of the trouble-shooting costs, the cost of transportation to and from depot, and the cost of repair. Since the units are hermetically sealed, repair is made only at the Aerospace Guidance and Metrology Center (AGMC). Thus, repair costs can be retrieved from a single source. Trouble-shooting costs are the costs incurred on the flight line to identify the IMU as having failed.

The cost of replacement must include the cost to transport a unit to and from depot and the cost to renew a nonfailed unit which is removed after a specified interval of time, presumably before failure. This entails repair or replacement of subcomponents from the unit which are approaching failure, thus, restoring the unit to a "good-as-new" condition (renewal). Costs which could be included are labor, materials, laboratory testing, setup costs and opportunity costs.

Consideration B: An in-service failure of the unit must not cause damage to other equipment in the system since this would create an additional variable cost of failure.

Consideration C: The unit must not be safety-critical.

Consideration D: The unit must fail often enough to provide adequate sample failure data.

Consideration E: The units must be traceable by some means of identification and field operating times specified so that failure cycles can be established.

The population of elements for this research study includes all KT-73 Inertial Measurement Units purchased by the Air Force and used on the A-7D aircraft. The sample includes all serial-numbered units beginning with an alpha prefix of "AF" ordered by the Air Force as spares prior to 19 April 1978. The purpose in limiting the sample space is to avoid the complications involving truncation of data. Truncation occurs when units which are not accounted for are removed from the sample. This destroys the validity of the life test.

Cost data for KT-73 in-service failures is available as a cost to repair through the AGMC Resources Division and is added to a cost of trouble-shooting and a cost of transportation, which are available through the K051 Maintenance Data Collection System. The cost to repair will be provided by AGMC as an actual cost to repair based on averages for each fiscal year. This same cost to repair and cost of transportation will represent the cost of replacement so that the difference, k, will be the cost of trouble-shooting.

In-service failure of the unit does not cause damage to other equipment, and the unit is not critical to safe operation of the aircraft. Failure does occur often enough to provide adequate data, and units can be traced by serial number, cycle number, and field operating hours. A functional description of the KT-73 IMU is contained in Appendix A.

While Bergman's method may be used to analyze any maintenance item where the objective is to minimize cost, inferences made from this study are applicable only to the sample space.

Data Collection

Using data collection methods of Crowe and Loman (11:31-38), actual failure data for the KT-73 units will be collected from the G078C Maintenance Data Collection System.

Data from the G078C includes an elapsed time indicator, a cycle number, and an identification serial number. The elapsed time indicator ensures that the time a unit is awaiting repair and in supply channels is not added to the operating time of the units. The identification serial number is necessary to identify the failure cycles associated with a particular unit. A failure cycle is defined as the operating time of a unit between renewal and failure.

Using both the "Aircraft Listing" and the "Field Operating Hours (FOH) by Cycle-Quarterly" G078C reports, failure Cycle 1 for each serial number included in the sample is identified. The field operating hours for each unit in Cycle 1 is then recorded and the times ordered from the smallest to largest. This can be accomplished through a simple FORTRAN program. The failure times are transferred to a data tape for use in calculating values for the TTT-plot (Figure 3-1).

According to MIL-STD-785B, Requirements for Military Programs (for Systems and Equipment/Development and Production); MIL-STD-781B, Reliability Tests: Exponential Distribution; and MIL-STD-756A, Reliability Prediction, the military services apply the basic assumption that failures are exponentially distributed; and, in fact, MIL-STD-785B permits a contractor to assume that equipment failures follow an exponential distribution whenever the standard is specified in the contract. The Computer Monitored Inspection Program uses this assumption (17:30). Herein lies one of the advantages of using the TTT-plot to analyze failure data. The TTT-plot method assumes that the life time distribution is unknown and analysis is based purely on observational data.

Since some units are expected to survive for a long period of time (calendar years), only old spares buys coded by "AF" serial numbers for the KT-73 IMU will be collected from the G078C Data Collection System.

The sample will be limited to those KT-73 IMU spares ordered by the Air Force prior to 19 April 1978 to ensure that a record of at least one failure for each unit has been recorded or that the unit is accounted for. The cutoff date is a convenient point between procurement packages in which large quantities of spares were ordered. A unit can be accounted for as not having been operated (on a supply shelf), discarded, or lost prior to normal failure (aircraft attrition). Units which are accounted for can be removed from the sample without bias. The period of time from which the data is drawn will depend upon the time the last unit in the sample fails. Conclusions from this study are limited to the data window.

Part of the cost of replacement is provided by AGMC and is the actual average cost to repair a unit for each fiscal year. Transportation costs are added to the cost to repair to arrive at the total cost of replacement, C_o. The cost to repair is obtained from data collected by the Resources Division (MAW) at AGMC in terms of dollar amount and is presented as an average actual cost to repair by fiscal year. Transportation costs are provided by the K051 data system at Headquarters AFLC. Data is extracted by the

Mission-Design-Series (MDS) of A-7D and by Work Unit Code (WUC) 73FAO for the KT-73 IMU. Under the WUC, a transportation cost in terms of dollar amount is recorded.

The cost of in-service failure, C_o+k, will consist of three parts: (1) the cost to repair, (2) the cost of transportation to and from depot, and (3) trouble-shooting cost. The preceding paragraph described how values for C_o (cost to repair plus cost of transportation) are found. The remaining element, trouble-shooting cost, is provided by the K051 data system under the same MDS, WUC and format as transportation cost. However, trouble-shooting costs are listed as quarterly totals under a separate column labeled "field maintenance" (base labor).

These three costs (repair, transportation, trouble-shooting) cannot be directly matched to the serial-numbered units in the sample, but they are presented as annual averages (for repair), and quarterly totals (for transportation and trouble-shooting), the latter of which can be summed over each fiscal year and averaged using the number of units repaired for each fiscal year, as provided by AGMC. This limitation was discussed in Chapter I.

To arrive at values for k, the difference between the cost of replacement and the cost of failure, C_o is subtracted from C_o+k for each fiscal year. The value of "k" in this study is the cost to trouble-shoot. Dividing each C_o by each k, then, provides a range of cost values, standardized to units of k dollars, which can be used to calculate an expected value for cost, C. The necessary calculations can be accomplished by a simple FORTRAN program.

The validity of the TTT-plot and graphical solution are dependent on the accuracy of the data collected from the G078C and K051 files. Limitations in this area were addressed in Chapter I. Additionally, a consistent maintenance policy must be assumed, and care will be taken to ensure that either none or all of the KT-73 units included in the sample have undergone modification.

Answering the Research Question

Before proceeding to the actual experiment, the research question should be readdressed within the context of the methodology.

The Research Question asks if Bergman's method can be applied in determining an optimal maintenance task interval based on the objective of minimizing total long-run average cost per unit time using actual field data. An optimal maintenance interval can be determined for the item used in this study by collecting data, as discussed in the previous section, for the cost of replacement and cost of failure, and by collecting failure data for the item. Based on the cost data, a value for C can be calculated and plotted. The observed failures collected from the G078C can be scaled and a TTT-plot constructed. Using Bergman's graphical technique, a tangent can be drawn from the point (-c,0) to the failure curve, and the index of the optimal replacement interval can be located at the abscissa (j_o/n). If the following specific criteria are met, the research question can be answered in the affirmative.

Must know:

1. Cost of replacement

2. Cost of failure

3. Time from renewal to failure (cycle) for all units in the sample

Must have:

A large sample of life times (greater than 30), since the estimate of the optimal interval improves with larger samples.

Must be able to:

1. Standardize cost of replacement and cost of failure to "k" units of dollars

2. Scale observed life times to Bergman's TTT-plot

3. Construct a graph of the scaled empirical life distribution

4. Construct a tangent to the failure curve with the greatest slope passing through the point plotted for replacement cost

5. Identify the index for the optimal interval using Bergman's graphical technique

If the research question can be answered in the affirmative, there are two secondary questions. Secondary Question "a" asks if the calculated interval for the units tested compares with the existing interval for the item. Since the KT-73 IMU has never had a maintenance interval assigned to it, its current interval is infinite. This study would recommend an infinite interval (fly-to-failure) if the empirical life distribution constructed on the TTT-plot from actual failure data is a 45-degree line (exponential) or convex (DFR). Figure 3-3 illustrates these possibilities. If the following required knowledge and procedures can be satisfied, secondary question "a" can be evaluated.

1. Know the current interval

2. Identify the distribution of observed failure data

3. Identify the index for the optimal interval using Bergman's graphical technique

4. Compare the current and calculated optimal intervals

5. Explain or reconcile differences, if any, between the current and calculated optimal intervals

Secondary Question "b" asks how sensitive the calculated optimal interval is to the uncertainty of cost. Based on individual cost data collected, a range of values for "C" can be calculated and analyzed using the Statistical Package for the Social Sciences (SPSS) Condescriptive computer program to identify the mean and standard deviation for C. Using values for C of plus and minus a given standard deviation from the mean, new tangents can be drawn to the failure curve and observations can be made concerning the effects of changes in C on the optimal replacement interval index. If the following required procedures can be satisfied, secondary question "b" can be evaluated.

1. Identify the mean and standard deviation of standardized cost values

2. Designate values for "C" above and below the mean, based on the mean and standard deviation

3. Identify the index for the optimal interval using Bergman's graphical technique for new values of "C," based on the standard deviation

4. Draw conclusions about the sensitivity of the optimal interval to uncertainty in cost

CHAPTER IV

APPLICATION AND ANALYSIS

Demonstrating Bergman's graphical method to determine an optimal maintenance task interval for an item in Air Force inventory requires application of the methodology described in Chapter III.

The Failure Data

Failure data for all KT-73 Inertial Measurement Units were collected for all units with serial numbers coded with an alpha prefix of "AF" ordered prior to 19 April 1978. This includes data on units coded AFORSSG, AFOTST1 and AF00001 through AF00094 for the first failure cycle (acquisition to first failure). The data was retrieved by cross-referencing both the "Aircraft Listing" and the "Field Operating Hours (FOH) by Cycle-Quarterly" reports from the G078C Data Collection System. Excerpts containing data from these reports are contained in Appendix B. Table 4-1 lists the units in the sample by serial number and corresponding times to failure for Cycle 1. The times to failure are listed in G078C reports under Cycle 1 of each serial number and denoted by "ETI IN," the elapsed time indicator reading (actual operating hours) upon arrival at AGMC. There are

TABLE 4-1

TIMES TO FAILURE BY SERIAL NUMBER

AFPRSSG	0855	AF00044	0285
AFOTST1	1111	AF00045	0426
AF00001	0099	AF00046	0490
AF00002	0229	AF00047	0180
AF00003	0615	AF00048	0211
AF00004	0127	AF00049	0161
AF00005	0121	AF00050	2764
AF00006	0853	AF00051	0434
AF00007	0349	AF00052	0150
AF00008	0487	AF00053	0109
AF00009	0558	AF00054	1001
AF00010	0852	AF00055	3007
AF00011	0260	AF00056	0183
AF00012	0181	AF00057	0217
AF00013	Attrited	AF00058	0701
AF00014	0932	AF00059	0240
AF00015	1837	AF00060	0164
AF00016	0182	AF00061	0101
AF00017	0508	AF00062	0565
AF00018	0107	AF00063	0120
AF00019	Attrited	AF00064	0222
AF00020	0498	AF00065	0122
AF00021	0492	AF00066	0299
AF00022	1081	AF00067	0212
AF00023	1408	AF00068	0377
AF00024	1099	AF00069	Attrited
AF00025	0828	AF00070	Attrited
AF00026	0164	AF00071	0129
AF00027	0388	AF00072	Attrited
AF00028	0414	AF00073	0645
AF00029	0417	AF00074	0122
AF00030	0103	AF00075	0764
AF00031	4126	AF00076	Attrited
AF00032	0334	AF00077	0292
AF00033	0109	AF00078	0365
AF00034	0153	AF00079	0454
AF00035	0163	AF00080	0897
AF00036	0093	AF00081	2132
AF00037	0483	AF00082	0347
AF00038	0414	AF00083	1081
AF00039	0451	AF00084	0873
AF00040	0095	AF00085	0220
AF00041	2045	AF00086	Attrited
AF00042	0254	AF00087	0332
AF00043	0141	AF00088	0163

TABLE 4-1 —Continued

AF00089	0814	AF00092	0154
AF00090	0436	AF00093	1765
AF00091	0121	AF00094	1560

eighty-nine units in the sample and times to failure were recorded on a raw data file called "TAPE 11" (Figure 4-1).

During collection of the failure data, it was noted that seven serial numbers could not be located: AF00013, AF00019, AF00069, AF00070, AF00072, AF00076 and AF00086. According to information received from AGMC, the KT-73 IMU Item Manager and Singer-Kearfott (manufacturer) any units that are lost to the system, that is, lost, stolen or demolished in an aircraft accident, are no longer tracked and the serial numbers are dropped from the rolls (2;10;16). Since the units contained in the sample used for this study are among the oldest spares buys made by the Air Force (circa 1970), the seven units for which serial numbers are missing are said to have attrited (2;10;16). A zero condemnation rate for the KT-73 IMU makes this the only reasonable conclusion. Hence, the seven units were removed from the sample without bias.

Total Time on Test-plot

Once the raw data was recorded on TAPE 11, it was necessary to order the failure times from smallest to largest. This was accomplished using the simple FORTRAN

100=0855	400=4126	700=0101
110=1111	410=0334	710=4565
120=0079	420=0109	720=0128
130=0229	430=0153	730=0222
140=0615	440=0163	740=6122
150=0127	450=0093	750=0299
160=0121	460=0463	760=0212
170=0553	470=0414	770=0377
180=0349	480=0451	780=0129
190=0487	490=0095	790=3645
200=0556	500=2045	800=0122
210=0852	510=0254	810=0764
220=0260	520=0141	820=0292
230=0181	530=0285	830=0365
240=0932	540=0426	840=0454
250=1837	550=0498	850=0897
260=0182	560=3150	860=2132
270=0588	570=3211	870=0347
280=0187	580=0161	880=1081
290=0498	590=2764	890=0873
300=0492	600=6434	900=0220
310=1081	610=0150	910=0332
320=1408	620=0109	920=0163
330=1099	630=1001	930=0814
340=0828	640=3087	940=0436
350=0164	650=0183	950=0121
360=0363	660=0217	960=0154
370=0414	670=0701	970=1765
380=0417	680=0240	980=1563
390=0123	690=0164	..

Fig. 4-1. TAPE 11: Raw Failure Data

program shown in Figure 4-2. The output, TAPE 12, from the program contains eighty-nine ordered failure times (Figure 4-3).

Having ordered the observed life time, $t_{(i)}$, the times were scaled to the total time on test, T_i, denoted by U_i. This was accomplished by inputting TAPE 12 to the FORTRAN program illustrated in Figure 4-4. The output of the program is shown in Table 4-2 which contains the observation number (i); the observed life times ($t_{(i)}$); the total time on test (T_i); and the scaled total time on test (U_i). The program also outputs a data file, TAPE 13 (Figure 4-5), containing all of the calculated U_i's.

Using Table 4-2, a Total Time on Test-plot was constructed for the eighty-nine observations in the sample. As in the example of Chapter III, Figure 4-6 illustrates the TTT-plot for the KT-73 IMUs used in this study.

An examination of the empirical life distribution shown on the TTT-plot for the eighty-nine observations indicates a failure curve which is slightly DFR (decreasing failure rate). Since the curve represents a plot of observed data, it is not smooth, but it would become smoother with larger samples. Most notable is the immediate leap from 0 to .16 which represents the smallest observed time to failure, 93 hours. Superimposed over the TTT-plot is an assumed theoretical exponential failure curve. The theoretical distribution is derived from consistently large historical sampling and is a perfectly smooth 45-degree slope.

```
      PROGRAM ORDER
C
      REAL T(89),TIME(89),T1(89)
      INTEGER I,J,X
C
C     ORDER FAILURE DATA
C
      DATA TIME/89*0.0/
      READ(11,*)(T(X),X=1,89)
C
      DO 10 I=1,89
         J=I
         DO 20 J=1,89
            TIME(I)=MAX(TIME(I),T(J))
20       CONTINUE
         X=1
         DO 30 X=1,89
         IF(T(X).EQ.TIME(I)) THEN
            T(X)=0.0
            GO TO 10
         END IF
30       CONTINUE
10    CONTINUE
       DO 40 I=1,89
         J=90-I
         T1(J)=TIME(I)
40    CONTINUE
      DO 50 I=1,89
         WRITE(12,'(" ",F6.1)')T1(I)
50    CONTINUE
C
      RETURN
      END
```

Fig. 4-2. Program to Order Failure Data

100=	93.0	400=	217.0	700=	509.0
110=	95.0	410=	222.0	710=	558.0
120=	99.0	420=	222.0	720=	565.0
130=	101.0	430=	229.0	730=	615.0
140=	103.0	440=	240.0	740=	645.0
150=	107.0	450=	254.0	750=	701.0
160=	109.0	460=	260.0	760=	764.0
170=	109.0	470=	265.0	770=	814.0
180=	120.0	480=	292.0	780=	828.0
190=	121.0	490=	299.0	790=	852.0
200=	121.0	500=	332.0	800=	853.0
210=	122.0	510=	334.0	810=	855.0
220=	122.0	520=	347.0	820=	873.0
230=	127.0	530=	349.0	830=	897.0
240=	129.0	540=	365.0	840=	932.0
250=	141.0	550=	377.0	850=	1001.0
260=	150.0	560=	388.0	860=	1081.0
270=	153.0	570=	414.0	870=	1081.0
280=	154.0	580=	414.0	880=	1099.0
290=	161.0	590=	417.0	890=	1111.0
300=	163.0	600=	426.0	900=	1408.0
310=	163.0	610=	434.0	910=	1560.0
320=	164.0	620=	436.0	920=	1765.0
330=	164.0	630=	451.0	930=	1837.0
340=	180.0	640=	454.0	940=	2045.0
350=	181.0	650=	463.0	950=	2132.0
360=	182.0	660=	487.0	960=	2764.0
370=	183.0	670=	490.0	970=	3007.0
380=	211.0	680=	492.0	980=	4126.0
390=	212.0	690=	496.0	..	

Fig. 4-3. TAPE 12: Ordered Failure Data

```
      PROGRAM TTTPLOT
C
      REAL Y(90),T(90),U(90)
      INTEGER I,J,K,N,X
C
C     DEFINITIONS:  TAPE12 CONTAINS ALL
C     OBSERVATIONS SMALL T(I)
C     N=TOTAL NUMBER OF OBSERVATIONS PLUS ONE
C     Y(I)=CAPITAL T(I), U(I)=U(I), I,J,K,X
C     ARE INDEXES
C
      N=90
      K=1
C
      DATA Y,T,U/270*0.0/
C
      READ(12,*)(T(X),X=2,N)
      PRINT'(1X,13X,"I",6X,"OBSERV",5X,"TOTAL",5X,"SCALED")'
      PRINT'(1X,12X,"NO.",6X,"TIME",6X,"TIME",7X,"TIME",/)'
C
      DO 10 I=2,N
           J=I-1
           Y(I)=(N-J)*(T(I)-T(K))+Y(K)
           K=K+1
10    CONTINUE
C
      J=1
      DO 20 I=2,N
           U(I)=Y(I)/Y(N)
           PRINT 40,J,T(I),Y(I),U(I)
           WRITE(13,'(" ",F9.6)')U(I)
           J=J+1
20    CONTINUE
C
40    FORMAT(1X,12X,I3,5X,F6.1,3X,F9.1,5X,F6.4)
      RETURN
      END
```

Fig. 4-4. Program to Scale Total Time on Test

TABLE 4-2

SCALED TIMES TO FAILURE

I NO.	OBSERV TIME	TOTAL TIME	SCALED TIME
1	93.0	8277.0	.1579
2	95.0	8453.0	.1612
3	99.0	8801.0	.1679
4	101.0	8973.0	.1712
5	103.0	9140.0	.1744
6	107.0	9479.0	.1808
7	109.0	9645.0	.1840
8	109.0	9645.0	.1840
9	120.0	10536.0	.2010
10	121.0	10616.0	.2025
11	121.0	10616.0	.2025
12	122.0	10694.0	.2040
13	122.0	10694.0	.2040
14	127.0	11074.0	.2112
15	129.0	11224.0	.2141
16	141.0	12112.0	.2310
17	150.0	12769.0	.2436
18	153.0	12985.0	.2477
19	154.0	13056.0	.2491
20	161.0	13546.0	.2584
21	163.0	13684.0	.2610
22	163.0	13684.0	.2610
23	164.0	13751.0	.2623
24	164.0	13751.0	.2623
25	180.0	14791.0	.2821
26	181.0	14855.0	.2834
27	182.0	14918.0	.2846
28	183.0	14980.0	.2858
29	211.0	16580.0	.3163
30	212.0	16748.0	.3195
31	217.0	17043.0	.3251
32	220.0	17217.0	.3284
33	222.0	17331.0	.3306
34	229.0	17723.0	.3381
35	240.0	18323.0	.3496
36	254.0	19084.0	.3640
37	263.0	19402.0	.3701
38	285.0	20732.0	.3949
39	292.0	21357.0	.4074
40	299.0	21409.0	.4084
41	302.0	23026.0	.4392
42	304.0	23122.0	.4411
43	347.0	23732.0	.4527
44	349.0	23825.0	.4545
45	365.0	24545.0	.4682
46	377.0	25073.0	.4783
47	382.0	25546.0	.4873
48	414.0	26638.0	.5081
49	414.0	26638.0	.5081
50	417.0	26758.0	.5104
51	426.0	27109.0	.5171
52	434.0	27413.0	.5229
53	436.0	27487.0	.5243
54	451.0	28027.0	.5346
55	454.0	28132.0	.5366
56	483.0	29118.0	.5554
57	487.0	29253.0	.5580
58	490.0	29346.0	.5598
59	492.0	29408.0	.5610
60	498.0	29588.0	.5644
61	508.0	29878.0	.5699
62	558.0	31278.0	.5966
63	565.0	31467.0	.6003
64	615.0	32767.0	.6251
65	645.0	33517.0	.6394
66	701.0	34861.0	.6650
67	764.0	36310.0	.6926
68	814.0	37410.0	.7136
69	828.0	37704.0	.7192
70	852.0	38184.0	.7284
71	853.0	38200.0	.7287
72	855.0	38239.0	.7294
73	873.0	38545.0	.7353
74	897.0	38929.0	.7426
75	932.0	39454.0	.7526
76	1001.0	40420.0	.7710
77	1031.0	41460.0	.7909
78	1031.0	41460.0	.7909
79	1099.0	41659.0	.7947
80	1111.0	41778.0	.7969
81	1402.0	44451.0	.8479
82	1560.0	45667.0	.8711
83	1765.0	47102.0	.8985
84	1837.0	47534.0	.9067
85	2045.0	48574.0	.9266
86	2132.0	48922.0	.9332
87	2764.0	50819.0	.9694
88	3087.0	51304.0	.9787
89	4126.0	52423.0	1.0000

100=	.157869	400=	.325105	700=	.569941
110=	.161246	410=	.329425	710=	.596647
120=	.167884	420=	.330599	720=	.600252
130=	.171165	430=	.336077	730=	.625050
140=	.174406	440=	.349618	740=	.639357
150=	.180818	450=	.364039	750=	.664994
160=	.183984	460=	.370105	760=	.692695
170=	.183984	470=	.394903	770=	.710618
180=	.200958	480=	.401713	780=	.719226
190=	.202507	490=	.420389	790=	.720383
200=	.202507	500=	.439235	800=	.728745
210=	.203994	510=	.441066	810=	.729432
220=	.203994	520=	.452721	820=	.735269
230=	.211243	530=	.454476	830=	.742594
240=	.214184	540=	.468211	840=	.752609
250=	.231844	550=	.478282	850=	.771036
260=	.243576	560=	.487305	860=	.790874
270=	.247697	570=	.500136	870=	.790874
280=	.249051	580=	.500136	880=	.794651
290=	.258398	590=	.510425	890=	.796940
300=	.261030	600=	.517120	900=	.847929
310=	.261030	610=	.522919	910=	.871125
320=	.262309	620=	.524331	920=	.898499
330=	.262309	630=	.534632	930=	.906739
340=	.282147	640=	.536635	940=	.926578
350=	.283269	650=	.555443	950=	.933216
360=	.284570	660=	.557961	960=	.969394
370=	.285752	670=	.559792	970=	.976654
380=	.318334	680=	.560975	980=	1.000000
390=	.319478	690=	.564439	..	

Fig. 4-5. TAPE 13: Calculated U_i's

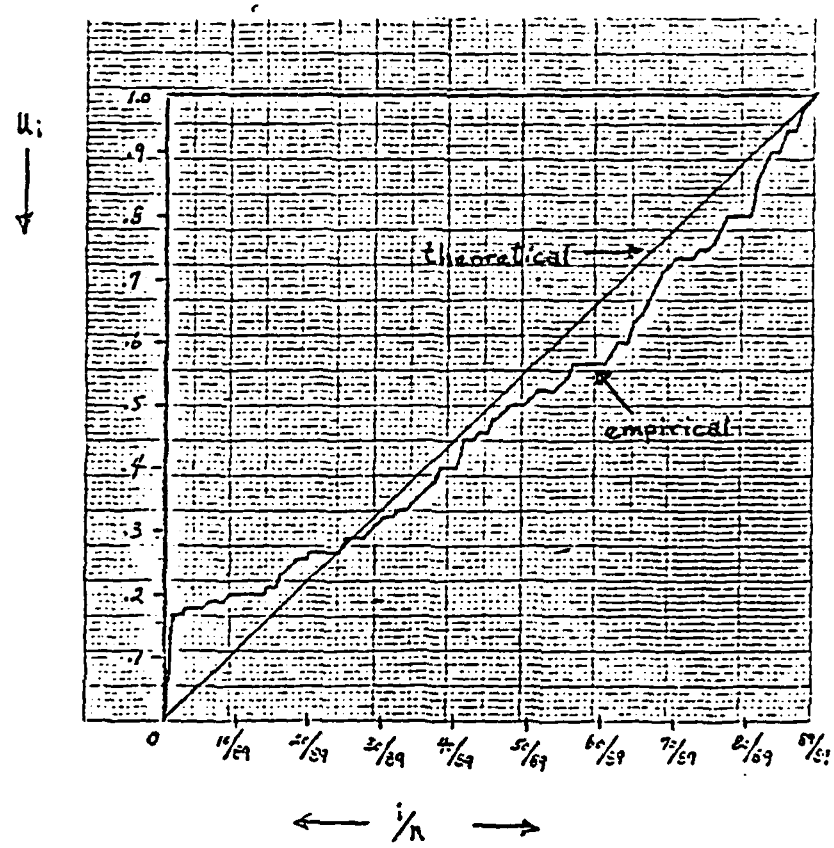

Fig. 4-6. Total Time on Test-plot

According to MIL-STD-756A and engineers at AGMC, a complex electronic component, such as the KT-73 IMU, when in steady state operation, is assumed to exhibit exponential failure characteristics (the flat portion of a typical bathtub curve).

Visually examining the two distributions, the difference in their shapes does not appear dramatic. While the assumed distribution exhibits a constant failure rate, the empirical distribution exhibits a slightly decreasing failure rate. The statistical significance of the difference was not analyzed. With Bergman's method, the empirical distribution can be visually recognized as a DFR, exponential or IFR (9:468).

Cost Data

To find the optimal replacement interval, requires balancing the cost of replacement (scheduled maintenance), C_o, with the cost of failure (unscheduled maintenance), C_o+k, where k represents the difference between cost of replacement and cost of failure.

The collection of cost data was influenced by the formats used by the data collection systems which contained the needed information. As explained in Chapters I and III, the cost of replacement includes the cost to repair and the cost of transporting units to and from depot. The cost of failure includes these costs plus the additional cost of trouble-shooting. Cost data was collected for the period from FY 72 through FY 81 to generally coincide with the time period during which failures occurred for units in the sample. However, since the cost data collected for this period was in aggregated form, they represent the expected costs for the entire population of KT-73 IMUs repaired and processed through the system.

The cost to repair a unit at depot was provided by the AGMC Resources Division and represents an actual cost to repair based on averages for each fiscal year beginning with FY 81 and going back to FY 72. Table 4-3 contains average repair cost by fiscal year and total number of units repaired for each time period. It should be noted that AGMC provided separate averages for FY 76 (ending 30 June 1976) and for the transition quarter 76T (ending 30 September 1976). A single average for FY 76 was derived by multiplying the average cost per unit for FY 76 times four and adding the average cost per unit for 76T, then dividing by five.

TABLE 4-3

AVERAGE COST TO REPAIR KT-73 IMU

Period	Average Cost/ Unit	Total Units Repaired
FY 81	$4350	312
FY 80	4053	358
FY 79	3378	358
FY 78	4104	335
FY 77	2873	360

TABLE 4-3—Continued

Period	Average Cost/ Unit	Total Units Repaired
FY 76	$4138	489
FY 75	3126	447
FY 74	2967	502
FY 73	4005	344
FY 72	3203	73

Transportation costs were extracted from the K051 Maintenance Data Collection System as quarterly totals under "packing-shipping cost" for WUC 73FAO. The listing was found under the Logistic Support Cost Breakdown for the A7-D Aircraft. Copies of the microfiche files containing the data are contained in Appendix C. Cost data was only available as far back as the fourth quarter of FY 72, and not all of the information was available at Headquarters AFLC. Data for the second quarter of FY 79 was retrieved by telephone from the Sacramento Air Logistics Center. Table 4-4 contains the quarterly transportation cost totals for each quarter beginning with the fourth quarter of FY 81 and going back to include the fourth quarter of FY 72. Annual averages were then computed by summing the four quarterly totals in each fiscal year and dividing by the number of known units repaired by AGMC (Table 4-3) in the same year. For FY 76, an annual average was derived by summing the four quarterly totals for FY 76 and the quarterly total for 76T, then dividing by the number of units repaired in FY 76 (which includes 76T). The average transportation cost per unit for FY 72 was derived by counting the number of units repaired by AGMC between the 183 and 274 days (fourth quarter) of FY 72 using the G078C reports and dividing that number into the fourth quarter total for FY 72.

TABLE 4-4

TROUBLE-SHOOTING AND TRANSPORTATION COSTS
QUARTERLY TOTALS

Period	Trouble-shooting	Transportation
4 FY 81	$108367	$2841
3 FY 81	91920	1527
2 FY 81	95520	1951
1 FY 81	105206	2071
4 FY 80	124926	2868
3 FY 80	132477	3134
2 FY 80	85000	4531
1 FY 80	65264	2822
4 FY 79	97117	5129
3 FY 79	69190	3505
2 FY 79	71969	2992
1 FY 79	94732	3932
4 FY 78	98908	5386
3 FY 78	72248	3896
2 FY 78	69022	2961
1 FY 78	63424	2546
4 FY 77	69613	3543
3 FY 77	66644	3769
2 FY 77	66932	2384
1 FY 77	64854	3154
FY 76T	88377	4313
4 FY 76	78458	5407
3 FY 76	75966	2877
2 FY 76	57687	2970
1 FY 76	75126	3942
4 FY 75	79169	3926
3 FY 75	89018	5700
2 FY 75	58926	3476
1 FY 75	76344	3669
4 FY 74	55584	3898
3 FY 74	43003	2711
2 FY 74	40731	2659

TABLE 4-4—Continued

Period	Trouble-shooting	Transportation
1 FY 74	$ 44290	$3173
4 FY 73	51740	3424
3 FY 73	47143	1930
2 FY 73	39361	1750
1 FY 73	41243	2249
4 FY 72	34127	814

Once annual averages were collected for the cost to repair and computed for the cost of transportation, these two costs were added for each corresponding fiscal year to produce annual averages for the cost of replacement, C_o, for FY 72 through FY 81.

The cost of failure includes the cost of replacement, C_o, plus an additional cost, k. For this study, the additional cost or difference, k, was defined as the cost to trouble-shoot a unit failure. Trouble-shooting costs, like transportation costs, were collected from the Logistic Support Cost Breakdown of the K051 MDC System (Appendix C). The quarterly totals are listed under "field maintenance cost" for WUC 73FAO. Annual average trouble-shooting costs per unit failure were derived in the same way that transportation costs were computed. Table 4-4 contains the quarterly trouble-shooting cost totals for the same time period that transportation costs were collected.

In order to facilitate Bergman's graphical method, the cost of replacement, C_o, must be standardized to units of k dollars. Bergman refers to this standardized value as "C." To find C, the cost of replacement, C_o, which includes the cost of repair and the cost of transportation, must be divided by the additional cost of failure, k. In this study, a value for C was calculated for each fiscal year, from FY 72 through FY 81.

The entire range of calculations necessary to arrive at values for C for each fiscal year were accomplished using a FORTRAN program (Figure 4-7). The program calculates annual values for C_o, k and C. Data input included TAPE 20 and TAPE 21 which contained values transcribed from Tables 4-3 and 4-4, respectively (Figures 4-8 and 4-9). The output TAPE 22, displays ten values for C, one for each fiscal year (Figure 4-10).

Since Bergman requires a single fixed value for C, which represents an average long-term cost of replacement, a mean value for C based on the sample was required. Values for both the mean and standard deviation were found by subjecting TAPE 22 to the SPSS Condescriptive computer program. The program and results are contained in Figure 4-11.

Graphical Solution

Using the mean value of 5.206 for C, the point (-c,o) was located and a tangent drawn to the failure curve. Figure 4-12 indicates that the tangent point is at the upper right most portion of the failure curve. The abscissa of the

```
      PROGRAM COST
C
C     COMPUTE COST OF REPLACEMENT IN TERMS OF "K" DOLLARS
C     FOR GRAPHICAL ANALYSIS
C
      REAL CO(10),K(30),TRANS(30),C(10)
      INTEGER NREP(10),I,J
C
      DATA CO,K,TRANS,C,NREP/96*0.0,10*0/
C
      READ(20,*)(CO(I),NREP(I),I=1,10)
      READ(21,*)(K(I),TRANS(I),I=1,30)
      J=1
C
      DO 10 I=1,10
         TRANS(I)=TRANS(J)
         IF(J.EQ.30) GO TO 50
            J=J+1
         TRANS(I)=TRANS(I)+TRANS(J)
            J=J+1
         TRANS(I)=TRANS(I)+TRANS(J)
            J=J+1
70       TRANS(I)=TRANS(I)+TRANS(J)
            J=J+1
         IF(J.EQ.25) GO TO 70
50       TRANS(I)=TRANS(I)/NREF(I)
10    CONTINUE
C
      J=1
      DO 20 I=1,10
         K(I)=K(J)
         IF(J.EQ.30) GO TO 60
            J=J+1
         K(I)=K(I)+K(J)
            J=J+1
         K(I)=K(I)+K(J)
            J=J+1
60       K(I)=K(I)+K(J)
            J=J+1
         IF(J.EQ.25) GO TO 60
60       K(I)=K(I)/NREP(I)
20    CONTINUE
C
      DO 30 I=1,10
         CO(I)=CO(I)+TRANS(I)
30    CONTINUE
C
      DO 40 I=1,10
         C(I)=CO(I)/K(I)
         WRITE(22,'(" ",F5.2)')C(I)
40    CONTINUE
C
      RETURN
      END
```

Fig. 4-7. Program to Calculate Cost "C"

Cost	No.	FY
100=4333	312	81
110=4453	358	80
120=3378	358	79
130=4134	335	78
140=2973	363	77
150=4138	469	76
160=3126	447	75
170=2967	502	74
180=4005	344	73
190=3283	73	72

..

Fig. 4-8. TAPE 20: Average Cost to Repair and Total Number of Units Repaired

Trouble-shooting	Trans	FY
100=106367	2641	
110=91920	1527	81
120=95523	1951	
130=105286	2071	
140=124926	2868	
150=132477	3134	80
160=65000	4531	
170=65264	2822	
180=97117	5129	
190=69190	3505	79
200=71969	2992	
210=94732	3932	
220=98908	5386	
230=72248	3896	78
240=69022	2961	
250=63424	2546	
260=69613	3543	
270=66644	3769	77
280=66932	2384	
290=64854	3154	
300=68377	4313	76T
310=78458	5407	
320=75966	2877	76
330=57687	2970	
340=75126	3942	
350=79169	3926	
360=89918	5700	75
370=58926	3476	
380=76344	3669	
390=55584	3898	
400=43003	2711	74
410=43731	2659	
420=44290	3173	
430=51740	3424	
440=47143	1930	73
450=39361	1753	
460=41243	2249	
470=34127	814	72

..

Fig. 4-9. TAPE 21: Costs of Trouble-shooting and Transportation

Cost "C"	FY
100= 3.41	81
110= 3.59	80
120= 3.68	79
130= 4.58	78
140= 3.91	77
150= 5.44	76
160= 4.66	75
170= 8.18	74
180= 7.73	73
190= 6.80	72

Fig. 4-10. TAPE 22: Standardized Cost of Replacement "C"

```
RUN NAME          CON
VARIABLE LIST     C
VAR LABEL         C,COST OF REPLACEMENT/
INPUT FORMAT      FREEFIELD
INPUT MEDIUM      DISC
N OF CASES        10
CONDESCRIPTIVE    C
STATISTICS        ALL
READ INPUT DATA

00035500 CM NEEDED FOR CONDESCRIPTIVE


CON
 2                                                    08/25/82  14.57.50.    PAGE

FILE - NONAME    (CREATED -   08/25/82)

VARIABLE  C              COST OF REPLACEMENT

MEAN            5.206     STD ERR          .564     STD DEV        1.783
VARIANCE        3.179     KURTOSIS       -1.048     SKEWNESS        .758
MINIMUM         3.410     MAXIMUM         8.180     SUM           52.060
C.V. PCT       34.246     .95 C.I.        3.931               TO   6.481
```

Fig. 4-11. SPSS Condescriptive Routine and Results

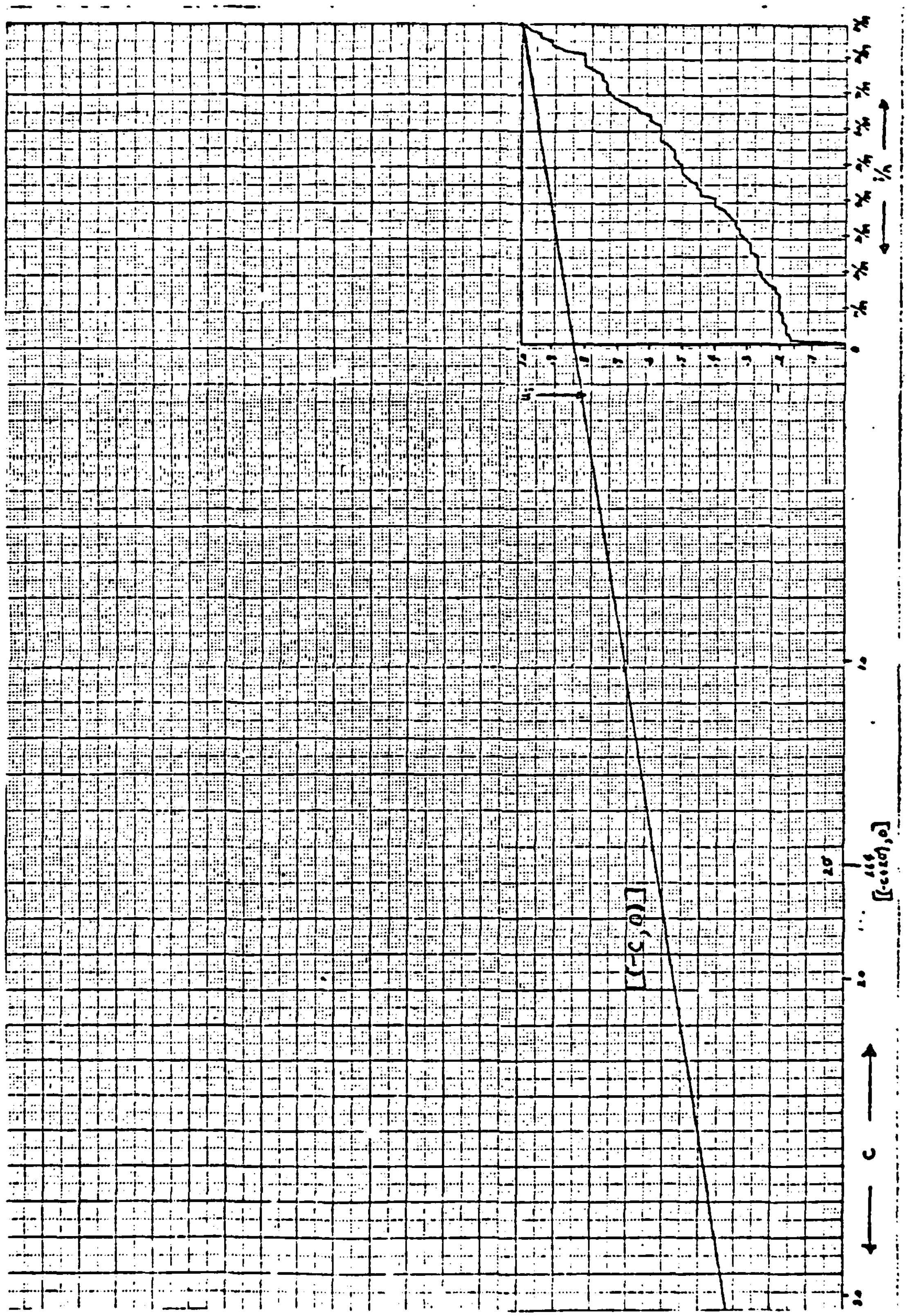

Fig. 4-12. Graphical Solution

AD-A123 025 A STUDY TO DEMONSTRATE THE APPLICATION OF A GRAPHICAL METHOD TO DETERMINE..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 2/3

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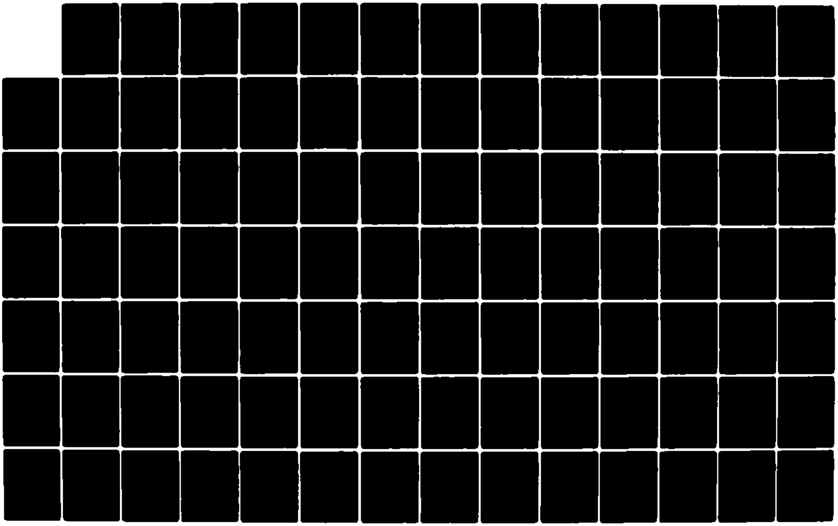
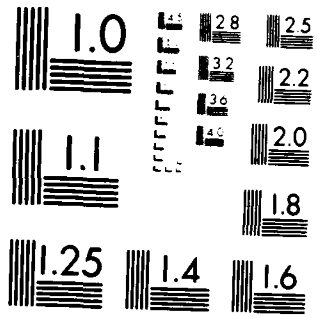




MICROCOPY RESOLUTION TEST CHART

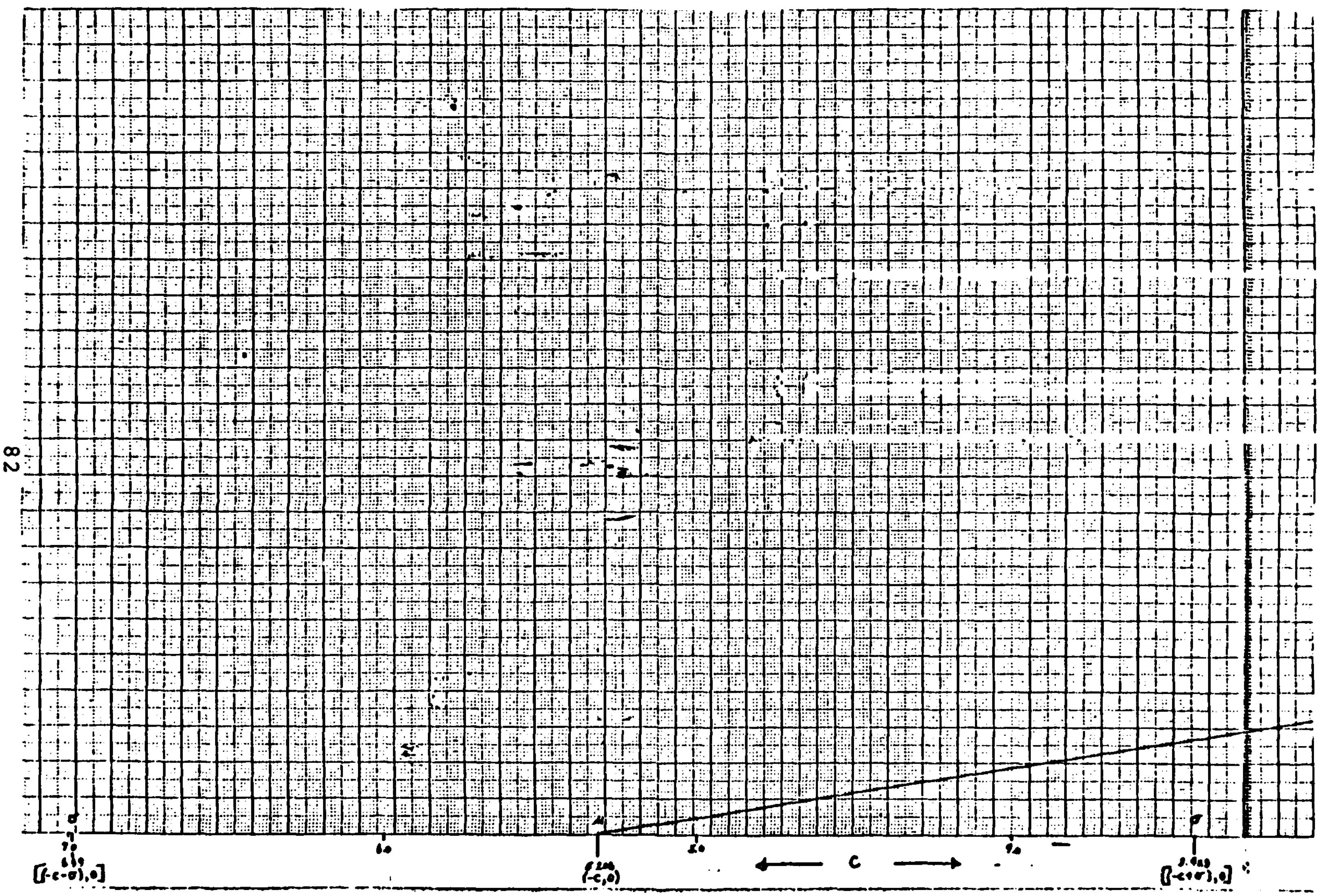


Fig. 4-12—Continued

tangent point is the value 89/89 or 1 and denotes the index of the optimal replacement interval, j_o. In this case, the estimate of the optimal replacement interval was interpreted to be infinite. As explained in Chapter III, this conclusion could have been reached without having performed the graphical solution since, by definition, exponential and DFR curves yield infinite replacement intervals.

The current interval and the optimal interval found using Bergman's method are the same. They are both infinite, and the optimal maintenance policy for the KT-73 IMUs in the sample is to operate until failure.

Sensitivity Analysis

In Chapters I and III, a large portion of discussion was devoted to limitations regarding cost measurement and cost uncertainty. Cost estimation results in a degree of uncertainty, and Bergman's graphical method can be used to perform sensitivity analysis with respect to cost.

By constructing a range of values for cost, C, about the mean, new lines tangent to the failure curve can be drawn through these points and observations can be made to identify changes, if any, in the optimal replacement interval index, j_o. In the last section, the mean value of 5.206 was used for C in finding the estimate of the optimal replacement index. The results of this study indicate that the replacement interval for the KT-73 IMU is infinite. Knowing this, it can be concluded at this point that the replacement interval is totally insensitive to changes in cost, C. However, for the purpose of demonstrating the method, a sensitivity analysis was performed.

The degree of uncertainty of cost for this study is unknown, and the variability of cost in the sample may not reflect the true variability of the population of costs associated with the KT-73 IMU. The size of the sample of cost values (ten cases) preclude efficient analysis of the distribution of costs calculated in this study. Employing a rule from Chebyshev's theorem that applies to any sample of measurements, regardless of the shape of the frequency distribution, at least 75 percent of the observations are expected to fall within two standard deviations of the mean (13:149). Figure 4-11 shows the calculated standard deviation for the sample to be 1.783. Since the mean is 5.206, the two standard deviations from the mean are calculated as

$$\bar{X} \pm S = (3.42,\ 6.99) \qquad \bar{X} \pm 2S = (1.64,\ 8.77)$$

These values (except 8.77) were plotted on the graph in Figure 4-13 and new lines drawn tangent to the failure curve. In the interest of conserving space, the point (-8.77,0), which represents two standard deviations above the mean, was not plotted. Also, since the point representing one standard deviation above the mean resulted in an

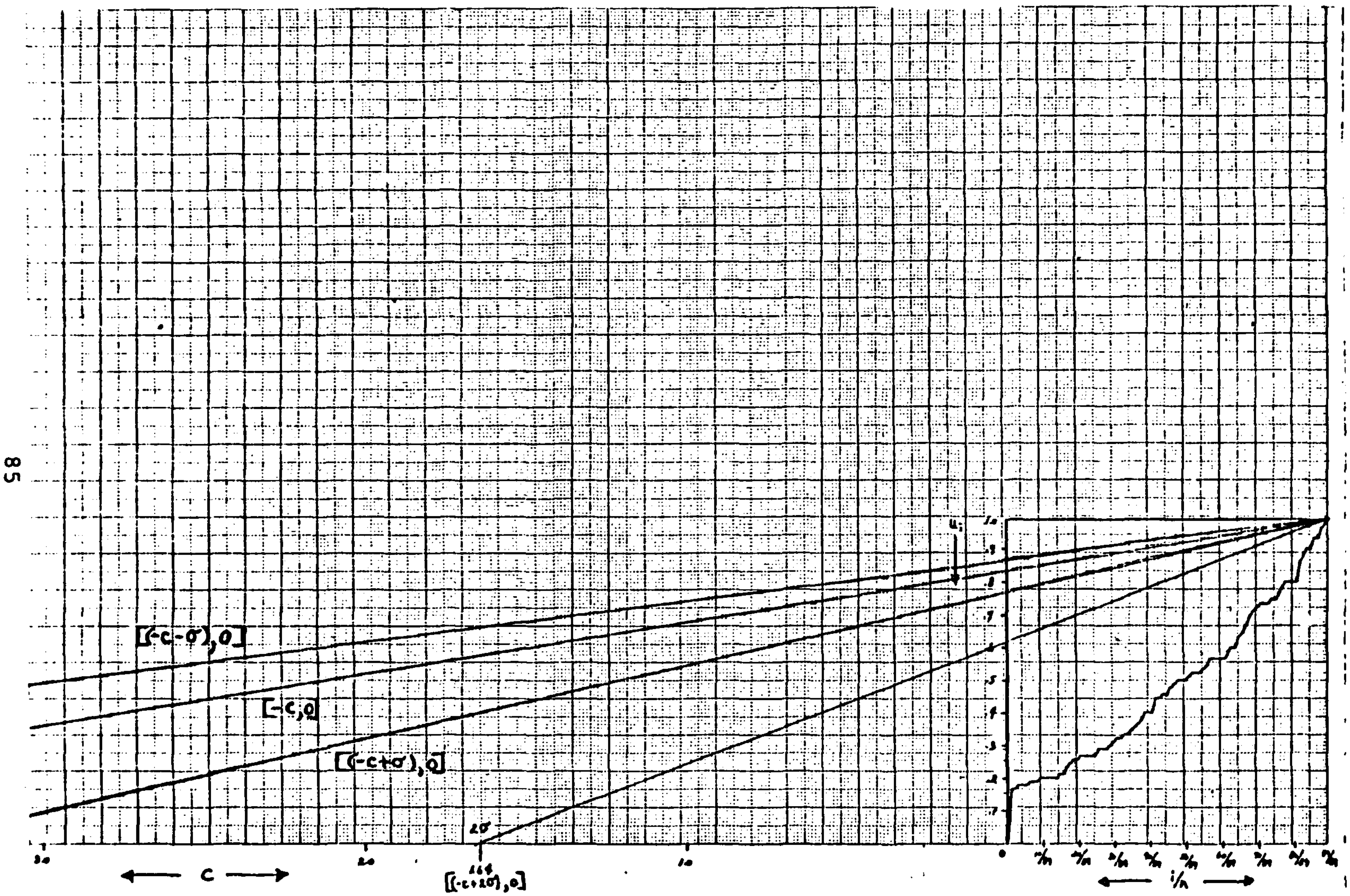


Fig. 4-13. Sensitivity Analysis

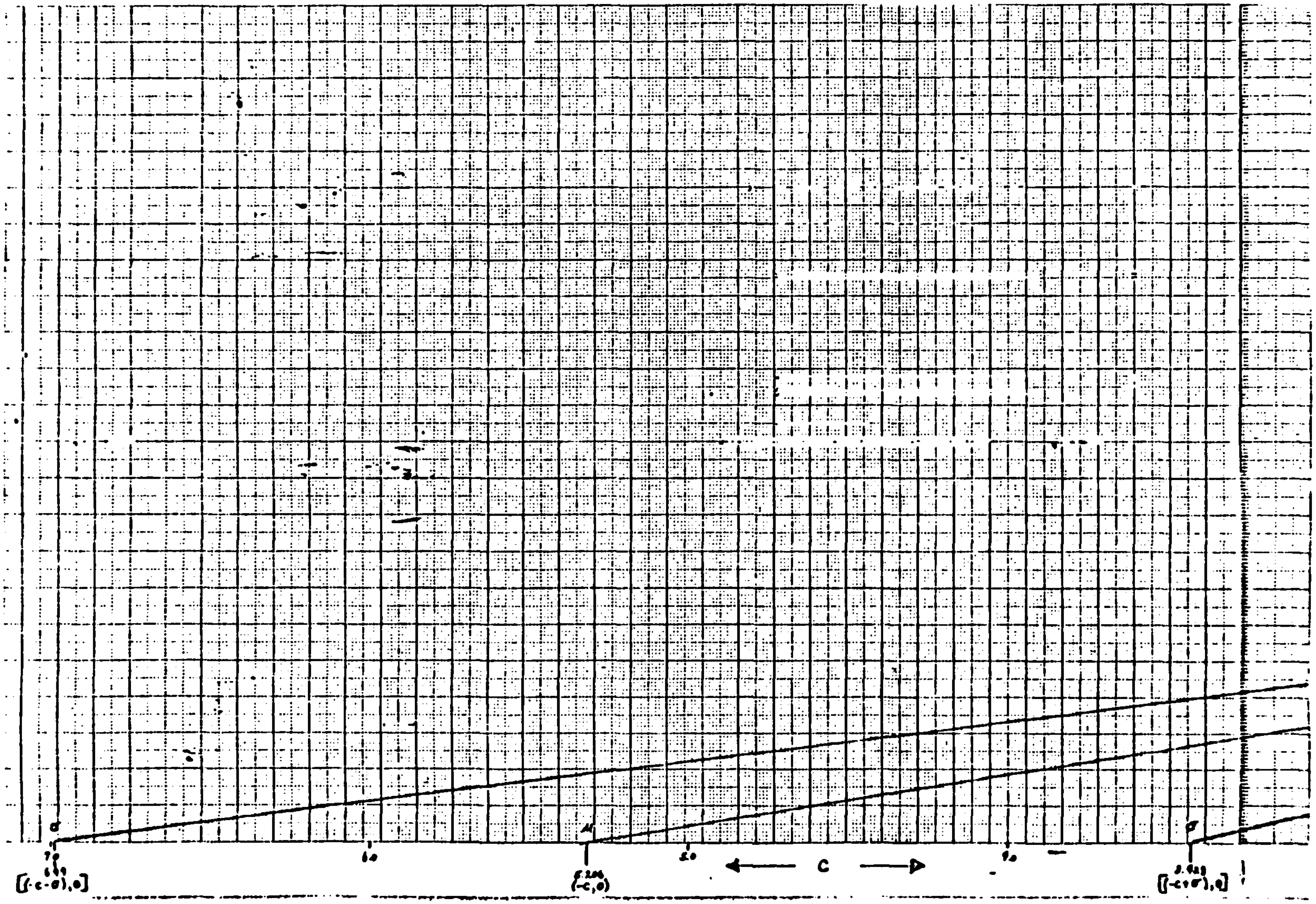


Fig. 4-13—Continued

infinite solution, it is known that any point beyond one standard deviation would produce an identical result given the failure curve for the units.

For this study, in each case in which a new line was drawn tangent to the failure curve from a new value for C, the solution was the same. In each case, the estimate of the optimal replacement interval was infinite resulting in a recommendation to operate the KT-73 IMU until failure. Hence, the optimal replacement interval is totally insensitive to changes in cost, C. Furthermore, it should be noted that all ten values for C contained in the sample fall within two standard deviations of the mean. This observation provides a "feel," as Bergman states it, for the confidence in the estimate of the optimal replacement interval.

Summary

The application and analysis of Bergman's method is summarized in light of the research question and the two secondary questions. In Chapter III, a set of criteria was established so that the degree to which the research answers these questions can be evaluated.

The research question asks if Bergman's method can be applied in determining an optimal maintenance task interval based on the objective of minimizing total long-run average cost per unit of time using actual field data. To answer the question, the cost of replacement, the cost of failure and the time from renewal to failure (cycle) for all units in the sample, must first be known.

The cost of replacement, C_o, was defined as the sum of the cost to repair a unit at AGMC and the cost to transport a unit to and from the depot. Data was gathered from the AGMC Resources Division and the K051 MDC for the KT-73 IMU in the form of dollar amounts. The cost of failure, C_o+k, includes these costs plus the additional cost of trouble-shooting a failed unit. Data for trouble-shooting costs was also gathered from the K051 MDC for the KT-73 IMU in the form of dollar amounts. No attempt was made to quantify other cost factors, such as Not-Mission-Capable time or readiness. Adding these costs to the cost of failure would have resulted in a larger value for k and a smaller value for C. However, since the interval for the KT-73 IMU is totally insensitive to changes in cost, the results would have been the same if these additional costs had been added to k.

The times from renewal to failure were taken as Cycle 1 for all units in the sample. The data was gathered from the G078C reports by serial number and cycle number. Seven serial numbers in the original sample of ninety-six were said to have attrited and were removed from the sample without bias, leaving eighty-nine units for the study.

The second set of criteria which must be met to answer the research question is to have a large sample (greater than 30). The sample of eighty-nine units meets this criterion.

The final set of criteria concerns procedures necessary to apply Bergman's method. If (1) the cost of replacement can be standardized to k units of dollars, (2) the observed life times can be scaled to Bergman's TTT-plot, (3) a graph of the scaled empirical life distribution can be constructed, (4) a tangent to the failure curve with the greatest slope passing through the point plotted for replacement cost can be drawn, and (5) the index for the optimal replacement interval can be identified using Bergman's graphical technique, then the research question can be answered in the affirmative.

Using a FORTRAN program, annual per unit averages for the cost of replacement and the additional cost of failure, k, were computed. The cost of replacement, C_o, was then standardized to k units of dollars by dividing C_o by k to arrive at values for C. The values for C were then analyzed for parameters and the mean value of 5.206 used to plot a point representing (-c,o). A line with the greatest slope passing through this point and tangent to the failure curve was drawn and the index for the optimal replacement interval identified as infinite. Accordingly, the recommendation based on this study is to operate the KT-73 IMU until failure.

Having met all of the criteria necessary, the research question is answered in the affirmative. As explained in Chapter III, having successfully applied Bergman's method for arriving at an optimal maintenance task interval, the reciprocal, $[C(T)]^{-1}$, of the objective function C(T) is minimized. The resultant solution is an optimal maintenance task interval which balances the cost of replacement with the cost of failure, and results in a minimum total long-run average cost per unit time.

Secondary Research Question "a" asks how the optimal interval for the units tested compares with the current interval for the item. To answer this question, (1) the current interval must be known, (2) the distribution of observed failure data must be identified, (3) the index for the optimal interval must be identified using Bergman's graphical technique, (4) the current and optimal intervals must be compared, and (5) differences, if any, between the two intervals must be explained or reconciled.

The KT-73 IMU is replaced upon failure and so the current task interval is infinite. The empirical life distribution revealed by the TTT-plot using field data for the units was slightly DFR, and the index for the optimal replacement interval denoted an infinite interval. Thus, the current and optimal intervals are the same. Since all of the criteria for answering secondary Research Question "a" were successfully met, the conclusion that the two intervals are identical can be asserted.

Secondary Research Question "b" asks how sensitive the calculated optimal interval is to the uncertainty of cost. To answer this question, (1) the mean and standard deviation for standardized cost values must be identified, (2) a range of values for C above and below the mean must be identified for use in performing the sensitivity analysis, (3) changes in the optimal index must be identified based on changes in C, and (4) conclusions about the sensitivity of the optimal interval to uncertainty in cost must be drawn from the analysis.

The ten values for cost of replacement, C, were subjected to analysis by the SPSS Condescriptive computer program to find values for the mean and standard deviation. Computing values for one and two standard deviations above and below the mean, new lines were drawn through these points and tangent to the failure curve. The index for the optimal replacement interval in each case denoted an infinite interval. Hence, it was concluded that the interval is totally insensitive to changes in cost, C.

Having successfully met all of the criteria, it was concluded that the optimal interval is totally insensitive to changes in cost.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

In this chapter, the authors endeavor to place in perspective the findings and observations gained through the demonstration of a simple graphical method for determining optimal maintenance task intervals using actual field data for equipment used in aircraft. The method is based on a control strategy which balances cost of replacement with the cost of failure resulting in a minimum total long-run average cost per unit time. The research conclusions, implications and recommendations are presented in the following sections.

Conclusions

The research objective was attained by answering the following research question and secondary questions:

Research Question

Can Bergman's graphical method be applied in determining an optimal maintenance task interval based on the objective of minimizing total long-run average cost per unit time using actual field data?

Bergman's method was successfully applied to a sample of KT-73 Inertial Measurement Units (IMUs) used in the Air Force A-7D aircraft. The study indicated that the component's optimal replacement interval is an infinite one (operate until failure). The solution was found graphically. Bergman's method assigns an infinite task interval to any component displaying an exponential failure distribution or decreasing failure rate (DFR); therefore, by definition, the task interval could have been specified once the TTT-plot had been constructed and the distribution identified as DFR.

Secondary Research Question "a"

How does the calculated optimal interval for the units tested compare with the current interval for that item?

The units tested exhibited a DFR, thus, an infinite task interval was assigned. The current interval is also infinite. Comparison of the optimal and current intervals show that they are identical. Hence, the current interval is optimal.

Secondary Research Question "b"

How sensitive is the calculated optimal interval to the uncertainty of cost?

It was demonstrated in Chapter IV that a range of values for cost on the order of two standard deviations about the mean caused no change in the optimal replacement interval. Therefore, it was concluded that the optimal replacement interval is totally insensitive to changes in cost. This conclusion could have been reached without performing the analysis since, by definition, a failure distribution which is DFR must yield an infinite interval.

The item chosen to demonstrate the graphical technique was not ideal for use in performing sensitivity analysis. The authors were unable to identify a unit of equipment that would display an increasing failure rate and that was traceable by serial number. This constraint severely limited demonstrating the usefulness of sensitivity analysis and the ease in which it can be accomplished using Bergman's method. However, the significant prospects that are offered for analyzing the uncertainty associated with cost through sensitivity analysis should not be overlooked.

Having answered the research questions, the researchers conclude that the application of Bergman's graphical technique to an IMU demonstrated a viable method for determining an optimal interval for an item in the Air Force inventory. It provides: (1) an easy way to give sensitivity analysis with respect to the uncertain relationship between cost of replacement and cost of failure, and (2) help in solving the problem of communication between the analyst and the decision maker (9:471) by presenting a visual means for analyzing failure data and by giving the analyst a "feel" for the uncertainties and relationships involved in arriving at the graphical solution.

Implications

Managerial Tool

Bergman's graphical method could provide the item manager with information to better manage the item. An empirical representation of the item's failure distribution would be known versus an assumed theoretical exponential failure distribution. The manager's planning could be influenced and enhanced significantly by better understanding the effects of changing cost on item intervals.

Opportunistic Maintenance Policy

This research was limited in scope in that it addresses optimal task intervals for individual components. To achieve an optimal maintenance policy for an end item, i.e., aircraft, the intervals of all components must be effectively incorporated into an optimal maintenance strategy for the end item. It is conceivable to combine optimal task intervals, achieved through Bergman's method, with the comprehensive maintenance strategy of an Opportunistic Maintenance Policy. Under such a policy, complex end items, i.e., aircraft, can be considered so that maintenance action taken on one part is made to depend on the state of the rest of the system. The use of such a maintenance policy in conjunction with optimal task intervals would result in some suboptimization of task intervals for the major end item; however, the final product would be a more effective maintenance strategy.

Smith conducted a Government-contracted study in 1980 in which he applied an opportunistic maintenance policy to the F100PW100 aircraft engine. The F100 engine is currently maintained under an on-condition policy, whereby the engine is removed and maintenance is performed to preclude failure of "driving" items only when required. Driving items are items whose failures are undesirable due to safety or economic consequences. Hence, this type of policy disallows scheduled maintenance for engine components on a hard time basis (27:3).

By applying an opportunistic policy, Smith reasons that maintenance actions not required at the time of engine removal (the opportunity) can be performed so as to avoid future costs (27:4). Using a total engine life-cycle cost formula, he balances the marginal cost to replace an item with the marginal cost of failure for the item and develops optimal Conditional Part Level (CPL) screens conditioned on engine status (27:22). A simulation of the engine's twenty-year life cycle indicated substantial savings, measured primarily by a reduction in engine removals. One of the major weaknesses in the analysis, according to Smith, regards assumptions in part failure distributions (27:39).

Since one of the keys to success of the model is the input of valid cost and failure data, Bergman's method could provide assistance in establishing an information storehouse from which to feed the opportunistic maintenance screening process.

Within the context of the Reliability-Centered Maintenance Program, the use of an Opportunistic Maintenance Policy for major end items, based on individual analyses of components through Bergman's method, might better realize the objective of the program which is to develop a scheduled maintenance program that will realize the inherent reliability levels of complex equipment at minimum total cost.

Recommendations

It was found during the course of this research that some areas were worthy of further study:

General

There is much theory (see Chapter II) concerning optimal maintenance policies used to determine task intervals and typically based on the objective of finding the interval which minimizes cost. A need exists to begin closing the gap between theoretical and practical applications of methodology to determine maintenance task intervals.

The Air Force is dedicated to pursuing a means of improving the analytical process for determining scheduled maintenance task intervals; therefore, there is a need to restructure portions of the data collection system so it is responsive to the data needs of managers and, ultimately, the analytical process brought about for determining task intervals.

Recommendations for Future Research

The amount of significant information obtainable through the use of Bergman's method is somewhat dependent on the failure distribution exhibited by the item under study. This is to say that sensitivity analyses and cost and interval relationships are better demonstrated by Bergman's method if the item displays an increasing failure rate versus an exponential failure distribution or decreasing failure rate. Therefore, it is suggested that further research be conducted with Bergman's graphical technique using an item which exhibits an increasing failure rate.

Any attempt to demonstrate the practical application of theoretical optimal maintenance models should be made within the context of an existing maintenance program. Only under this condition can the impact of the test be truly appreciated by an audience of potential benefactors. The attempt was made in this study to demonstrate Bergman's method within the context of the RCMP. However, in future research made within this context, a different approach is suggested. It is recommended that the item used for study be selected and characterized in accordance with the basic steps necessary to integrate items into the RCMP. Specifically, the item (1) should be identified as a significant item, (2) should have failure consequences (cost of failure) identified through FMEA, (3) should have a specific type of maintenance task assigned to it, and (4) should have a maintenance task interval assigned to it.

Complying with these basic steps will accomplish the following: (1) it will be known that the item for study qualifies for RCM analysis because of its value in terms of safety and/or economics, (2) specific failure consequences can be identified and subsequent attempts made to quantify them for purposes of the study, (3) it will be known which type of maintenance task (hard time, on-condition, condition monitoring) has been assigned to the item so that an appropriate methodology for selecting the interval can be used, and (4) it will be known what task interval (finite or infinite) has been assigned to the item so that the optimality of the interval can be evaluated based on the results of the study. In this way, conclusions can be made about the applicability of the method under study as well as about the appropriateness of current intervals.

APPENDICES

APPENDIX A

FUNCTIONAL DESCRIPTION AND INSPECTION CHECKLIST--
KT-73 IMU

The purpose of this booklet is to familiarise the reader with the basic modes of operation of the A7 IMU. This information should be of value in determining and isolating malfunctions of the system.

It is recognized that this is not an in-depth analysis of system operation. This information will be supplemented by on-the-job training and technical assistance from the Logistics Support Engineering staff.

VERTICAL G.W.S.

The motor windings of the gyro have a $\angle 0°$ and $\angle 90°$ 20 volt peak to peak 480 cycle signal applied at all times after system turn on. This voltage is supplied by the Power Supply Board. When the sequencing switch for Vertical G.W.S. is energized, a signal to applied to a relay driver on the Switching board. The relay K3 will couple an external supplied ground to the Vertical gyro which energizes the wheel.

CAGE MODE (A7 IMU)

The Cage Mode is for the purpose of aligning four gimbals to the attitude of the fixed frame of the platform. The various loops are standard servo loops employing direct current torquers.

The Azimuth pitch and outer roll synchros employ 26 vac. 400 hz excitation from an external source while the Inner Roll pickoff excitation is a system supplied 19.2 KHZ at 8 vrms. This signal is supplied by the Power Supply Board.

OUTER ROLL LOOP - The stators of the outer roll Synchro are mechanically connected to the fixed Gimbal; while the rotor winding is essentially part of the outer roll Gimbal. The displacement angle of the rotor winding to the stator winding (S3) is indicated by a voltage. When this voltage is at a null with the proper phasing the mechanical position of the gimbal is zero degrees. The 400 cycle error is routed to the switching board to the O.R. Amp. The O.R. Amp. demodulates the A.C. to D.C. The D.C. signal is then coupled thru the gimbal board. The D.C. then is applied to the O.R. torquer (B9) which rotates the O.R. gimbal until it is positioned to point at which error signal is nulled. The remaining stator outputs are used to display O.R. position on the Roll P.A.I. at initiation of vertical isolation.

PITCH LOOP - The pitch Loop is similar to the O.R. channel in as the stators of (B6) Pitch CX are physically mounted on the O.R. gimbal and the rotor is on the Pitch Gimbal. The 400 cycle error signal is taken off of S3 and coupled through the switching board via relays to the Gimbal board. At the Gimbal board the 400 cycle signal is applied to a demodulator circuit which also receives a 400 cycle reference signal. The output is a positive or negative D.C. voltage depending on the phase of the error signal. The ± D.C. is applied to a Power Amp. and coupled out to the torquer (B7) which drives the gimbal until the error is nulled. The remaining stator outputs are used to display Pitch angle on the P.A.T. during Vertical Isolation.

Inner Roll Loop - The I.R. Loop differs from the O.R. and Pitch only in the excitation used on the pick off which is 6 vrms. 19.2 khz. The pick off winding is mounted on the pitch gimbal and the rotor is positioned by the I.R. gimbal itself. The error signal from B4 is routed through the switching board and sent to the Gimbal board. The signal is then applied to demodulator which has a fixed reference signal of 19.2 khz. The ± D.C. level is then amplified by the Power Amp. and applied to the I.R. torquer B5 which drives the I.R. gimbal until the error signal is nulled.

Azimuth Loop - The Azimuth Loop differs from the previously described loops in as it uses an external reference for its positioning. The Azimuth CX is positioned so that when the rotor and the stator (S1) are parallel to the X Axis of the frame of reference the output represent Zero degrees. The error signal from the stators of B2 is routed out of the IMU and applied to a synchronous transformer. In the test equipment the rotor of the C.T. is mechanically positioned to the desired Azimuth angle. The stator outputs represents this angle and is applied to the transformer. The output of the transformer is the difference of the two inputs. The error signal is then amplified and applied to the Azimuth channel on the Gimbal board. There the signal is demodulated and amplified. The ± D.C. is applied to the Azimuth torquer B3. The Azimuth gimbal is driving until the error signal out of the test equipment is nulled. The stator outputs of B2 are also used to drive the Azimuth PAI.

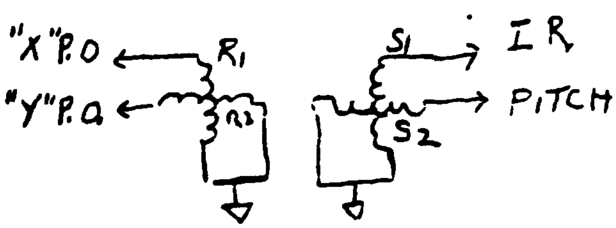
The various relays on the switching and Gimbal boards which are used for signal routing during the Cage Mode are energized by logic circuits on the switching board. The logic circuits are initiated by the sequencing switches on the test equipment.

VERTICAL ISOLATION

In this mode of operation there are actually two phases. The first being Low Gain and the second, Normal Gain. The only difference in the two phases is the input resistance to the demodulators in the Inner Roll and Pitch channels. These resistors are large during Low Gain and smaller during Normal Gain.

The purpose of Vertical Isolation is to cage the Inner Roll, Pitch and Outer Roll gimbals to the pick offs of the Vertical Gyro rather than to the synchros as in the Cage Mode. The circuit operation is as follows:

The outputs of the Vertical Gyro referred to as "X" axis pick off and "Y" axis pick off are amplified in the Gyro electronics board and applied to the rotor windings of the coordinate resolver (B1). The rotor of B1 is mechanically positioned at the function of the Azimuth gimbal. The stators position is fixed due to the fact that they are physically attached to the Inner Roll Cap in which the cluster is housed. The rotor windings R1 and R2 and stator windings S1 and S2 are displaced from each other by 90 degrees. Refer to the figure below.



When the Azimuth is positioned to zero degrees and the Platform is aligned along the X axis frame of reference the rotor R1 and the stator S1 are both aligned to zero degrees. Atthis time the "X" pick off is applied to R1 and induced into the S2 winding. If the Azimuth or the Platform is repositioned to an angle of 90 or 270 degrees the voltage applied to R1 would be induced in the S2 winding and any voltage on R2 would be coupled to S1.

The signal representing "X" axis pick off which isapplied to R1 and induced into S1 is applied to the Inner Roll channel on the Gimbal board. The signal is demodulated, amplified and applied to the Inner Roll torquer.

At this time, the Outer Roll gimbal, which was caged to its own synchro output, is caged to the output of the Inner Roll pick off. The I.R. pick off signal is coupled to the Outer Roll Amp. on the Switching board. The reference input is switched from 400 HZ to 19.2 KHZ by circuits on the Switching board. The output from the O.R. Amp. is sent through the Gimbal board and applied to the Outer Roll torquer B9. The outputs of the O.R. CX (B8) are used to display position on the Roll P.A.I.

The "Y" pick off signal is applied to R2 of B1 coupled to S2 and applied to the Pitch channel on the Gimbal board. At this time the reference input to the demodulator is switched from 400 HZ to 19.2 KHZ by circuits on the Switching board. The signal is demodulated, amplified and applied to the Pitch torquer B7. The outputs of the Pitch CX (B6) are used to display position on the Pitch P.A.I.

The Azimuth loop remains asit was in Cage Mode. The various relays on the Gimbal and Switching boards are driven by inputs to the Switching board from the sequencing switches on the test console.

AZIMUTH G.W.S.

The operation of Azimuth G.W.S is identical to Vertical G.W.S. except that the switching of the ground is performed by relay K8.

See Vertical G.W.S. signal flow print.

AZIMUTH ISOLATION

This mode consists of two phases of operation. The first being, caging of the Azimuth gimbal to the Z Axis pick off of the Azimuth gyro. The "Z" pick off is applied to the Gyro Electronics board where it is amplified to a useful output level and then is sent to the Azimuth channel of the Gimbal board. The signal is coupled through a 1 megohm resistor by the action of relay K10 and through the contacts of K6 to the demodulator stage. The reference input is switched during this mode of operation from 400 HZ to 19.2 KHZ by the Switching board. The ±D.C output is applied to the amplifier section and applied to the Azimuth torquer (B3).

The second phase consists of two separate actions; switching to high gain in the azimuth channel and the caging of the Redundant loop to its own pick off.

High gain switching of the Azimuth channel is accomplished by the energizing of relay K10. The contacts of K10 will insert a 30K ohm resistor in place of the 1 mehohm resistor thus increasing gain of the stage.

The output of the Redundant axis of the Azimuth Gyro is amplified, demodulated and amplified again and applied to the redundant torquer. The circuit is completed by the action of relay K2 on the Switching board which places the other side of the torquer to ground.

COURSE LEVEL

The purpose of this mode of operation is to level the double axis accelerometer so that the two axis are perpendicular to the gravity vector. Since both channels are effectively identical, only the "X" axis will be discussed.

Following the previously discussed modes of operations the accelerometers, particularly the double axis, will not be perfectly level to the earth and there will be an output representing this misalignment. The output signal which is 19.2 KHZ is amplified by pre-amps located on the D/A. The signal is then sent to the restoring amp. on the accelerometer Electronics board. The output is a ± D.C. representing the account of off level. The D.C. signal is applied through the torquer coil and routed to a junction point. Also tied to the junction point is a D.C. level which is used to null out the amount of error signal which is due to mass unbalance of the accelerometer. This voltage is supplied by the resistor network R32 and R33 on the Compensation Board.

The D.C. signal is applied to the Power Supply Board and through relay K2 to the "X" Coarse Level amp. The amplified signal is then sent to the Switching board. On this board the relay K10 serves a function of increasing or decreasing the gain of the signal. During Back-up level the 3.4K resistor is inserted into the circuit to lower the gain. In Coarse Level the relay is as above. The output of the Switching board is sent back to the Compensation board, through R18 and R19 and applied to the "Y" axis torquer of the Vertical Gyro. This signal will precess the gyro wheel causing an output on the "Y" pick off. The pick off signal is then amplified and applied to the rotor winding of the coordinate Resolver (B1). At this time if the Platform is aligned along the "X" axis and the heading is zero degrees, the signal will be coupled into the stator winding which feeds the Pitch channel of the Gimbal board. As the Pitch gimbal is rotated the output of the "X" axis accelerometer will diminish. The Pitch gimbal will continue to torque until the output of the accelerometer is nulled out.

The "Y" axis error signal will cause torque to be applied to the "X" axis of the Vertical Gyro who's output will cause the Inner Roll gimbal to be rotated until the error signal is nulled.

ALIGN NORMAL

In this mode of operation the Platform is free to drift with Earth Rate. At this present position of Laditude the drift rate about the X axis is 11.519 DEG/HR. and the drift rate about the ~~Xx~~ Z axis is 9.672 DEG/HR. This drift will appear as movement on the Roll and Azimuth API's respectively.

There are certain corrections in respect to the Gyroflex that are taken into consideration at this time. All gyros exhibit drift characteristics and there are two classifications of drift. The first is referred to as "random drift" add is not acceptable for use in an IMU. The second is "fixed drift". The rate of drift is measurable and can be compensated for.

There are two other characteristics of the Gyroflex to be accounted fnd corrected for. They are both due to the actual construction of the wheel assembly of the gyro and will not be discussed in detail.

Both the X and Y axis of the Vertical Gyro and the Zaxis of the Azimuth will have in their pick-off signal a voltage which is due to "in phase" error, also referred to as Spring Rates. Located on the Compensation Board are Amplified/Demodulator stages and "select during test" resistors which are used to null out the "In phase" error.

The other type of error is referred to as quadrature. Due to the "torque about - precess about" principle of gyros, this signal is applied to the axis 90 degrees displaced from where the error is detected. In ~~xxx~~ other words, if the quadrature error is taken off the X axis pick-off it is applied to the Y axis torquer.

The fixed drift mentioned previously is compensated by applying a voltage to the X,Y and Z torquers, which will cause movement that is equal but opposite the drift, there fore, eliminating the affect of drift. This voltage is inserted into the circuit by R10, R11 and R12. The pots are also referred to as Restraints.

ALIGN NORMAL (FAST SLAVE)

In fast slave mode the Azimuth, Pitch and Roll gimbal position is determined by the angular displacement of their respective API's. Asthe API position is changed a signal is applied to the proper gyro torquer causing the gimbal to be repositioned.

The signal flow for Fast Slave is as follows:

AZIMUTH - A demodulated signal representing Azimuth PAI position is coupled across the contacts of relay K15 on the Switching Board and is applied through resistors R22 and R23 on the Compensation Board. This D.C. signal is applied to the Z torquer. The other side of the torquer is tied to ground via the Switching Board from an external source. The resultant Z pick off is amplified in the Gyro Electronics Board and applied to the Azimuth channel of the Gimbal Board. The output of the Gimbal Board is applied to the Azimuth Torquer which causes the Azimuth CS output to change. When the Azimuth CX position output is equal to the PAI's position the error signal applied to the Z torquer drops to zero and the Cluster stops driving.

The operation of the Pitch and Roll Gimbals during Fast Slave is identical except the error signals are applied directly from the PAI's to the X and Y gyro torquers.

ALIGN NORMAL (SLEW)

This mode of operation is identical to Fast Slave except the Azimuth, Pitch and Roll Gimbals are not repositioned by an error signal from the API's but rather by a $\pm$ 15 vdc signal from the Switching Board.

The selection of which Gimbal is slewed and in what direction is contralled by switches on the test equipment. Since the method of slewing all three of the Gimbals are somewhat ~~but~~ identical only the Pitch will be explained:

When Y Slew is selected relay K14 is de-energized by the signal applied to Z20 on the Switching Board. This ties the contacts of K14 to the Contacts of K12. Depending upon if K12 is energized or not a $\pm$ 15 vdc signal is applied to the Y torquer via the Compensation Board. The Y pick off signal is amplified and applied to the coordinate resolver and sent to the Pitch channel on the Gimbal board. The signal is applied to the Pitch Torquer Relay K12 determines direction of Slew.

The Azimuth Slew differs from Pitch and Roll to the extent that the Z torquer has a $\pm$ 15 vdc on one side and a - 15 vdc on the other. These polarities are reversed by the action of K9 when actuated by the polarity swithh on the T/E.

DIGITAL LEVEL

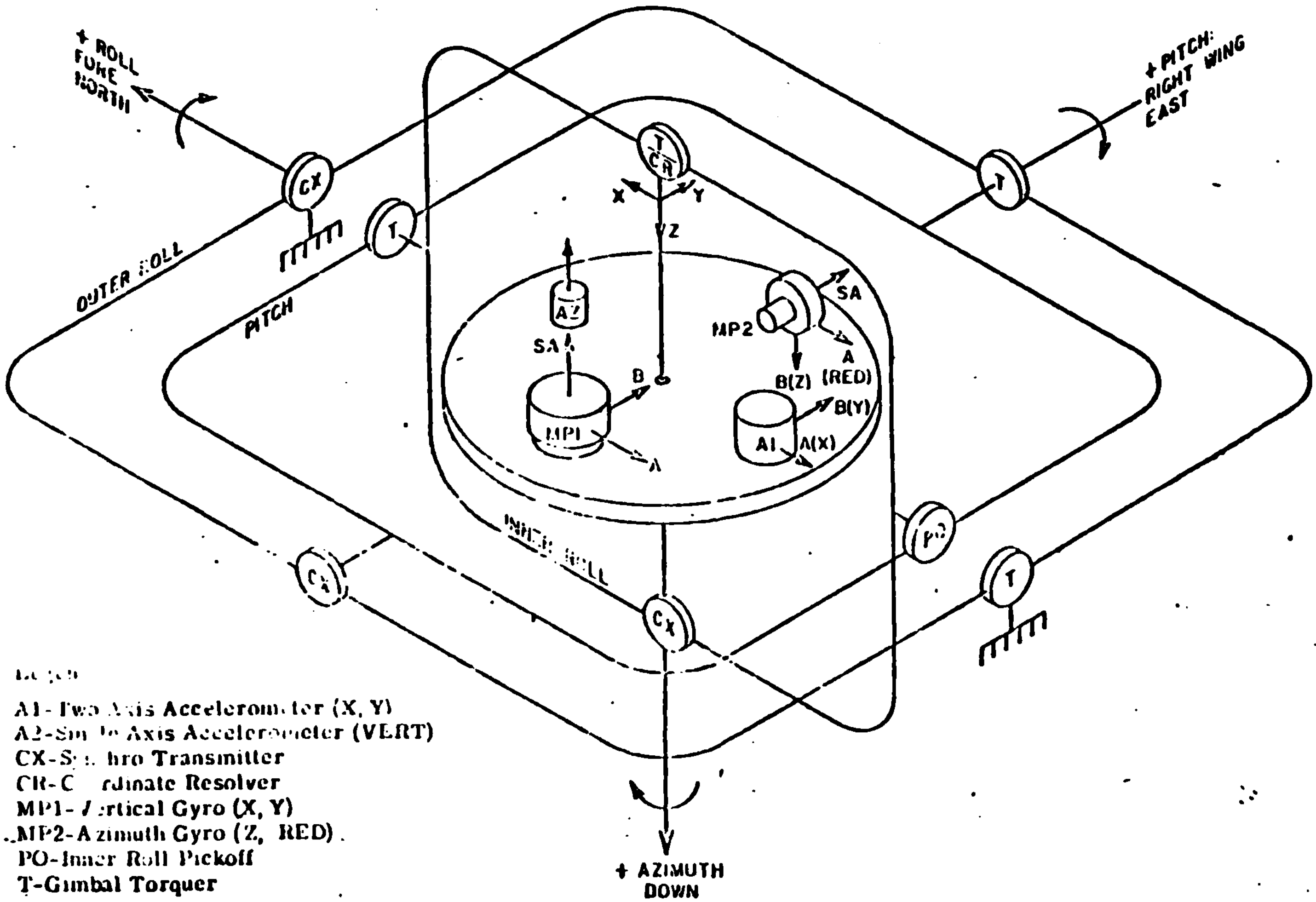
This is the mode of operation where the system is refined. That is to say that we want to perfectly level the system in respect to the earth's surface and insure that the system is pointed exactly north.

This is accomplished in the following manner. The X, Y and Z accelerometer signals are applied to the CAPRI Board where they areintegrated into X,Y and Z velocity signals. These signals are displayed on the CAPRI counters. The X and Y CAPRI signals are also applied through the Digital Level Control Module to the Gypto Control Module. The X CAPRI signal is converted to pulses and is applied as Y GYpton pulses to the Switching Board. The Switching Board circuitry changes the one signal into two signals 180 apart. The two signals representing Y Gypto are applied to a push-pull circuit on the Gyro Electronics Board and the Y Bias torquer. This signal will null out any off level condition of the X accelerometer.

The X Gypto circuitry is identical to the Y Gypto except t for the amount of pulses that the X Gypto puts out. ~~xxx~~ As discussed previously, the X axis of the V rtical Gyro if not corrected would appear to drift with E rth's Rate. In Digital Level the output of the Y accelerometer is due to the Earth's Rate on the X axis Gyro. The false acceleration signal is integrated in the CAPRI Board and converted to pulses to be applied to the X bias torquer. The amount of pulses required to keep the Y axis of the D/A accelerometer perfectly level with the Earth's surface is the Earth's Rate correction signal for the X axis Gyro.

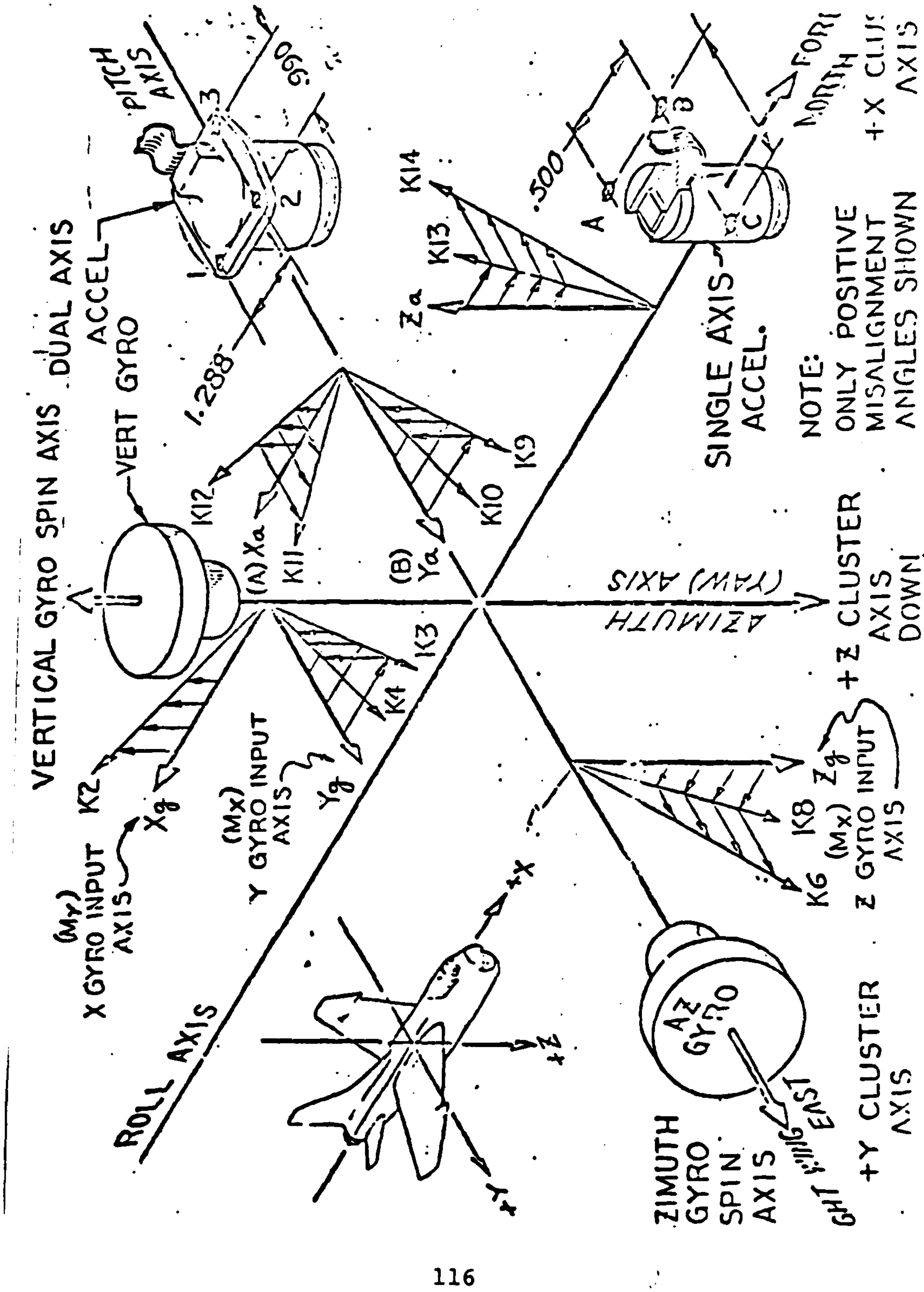
The Z Gypto circuit is used to null out the effect of Earth's Rate about the Z axis. To supply the correct signal for the Azimuth Gyro the output of the Azimuth CX is used. As the Z axis starts to drift, the Azimuth CX output changes to indicate this apparent procession. The signal is applied to the "Z" VCO Module where the 400 cps signal is converted into digital pulses. This signal is applied through the Test Equipment to the Z Gypto circuitry on the Switching Board and finally to the Z Bias torquer. The torquing signal is used to drive the Z axis of the Azimuth Gyro in a direction which is equal but opposite the drift rate..

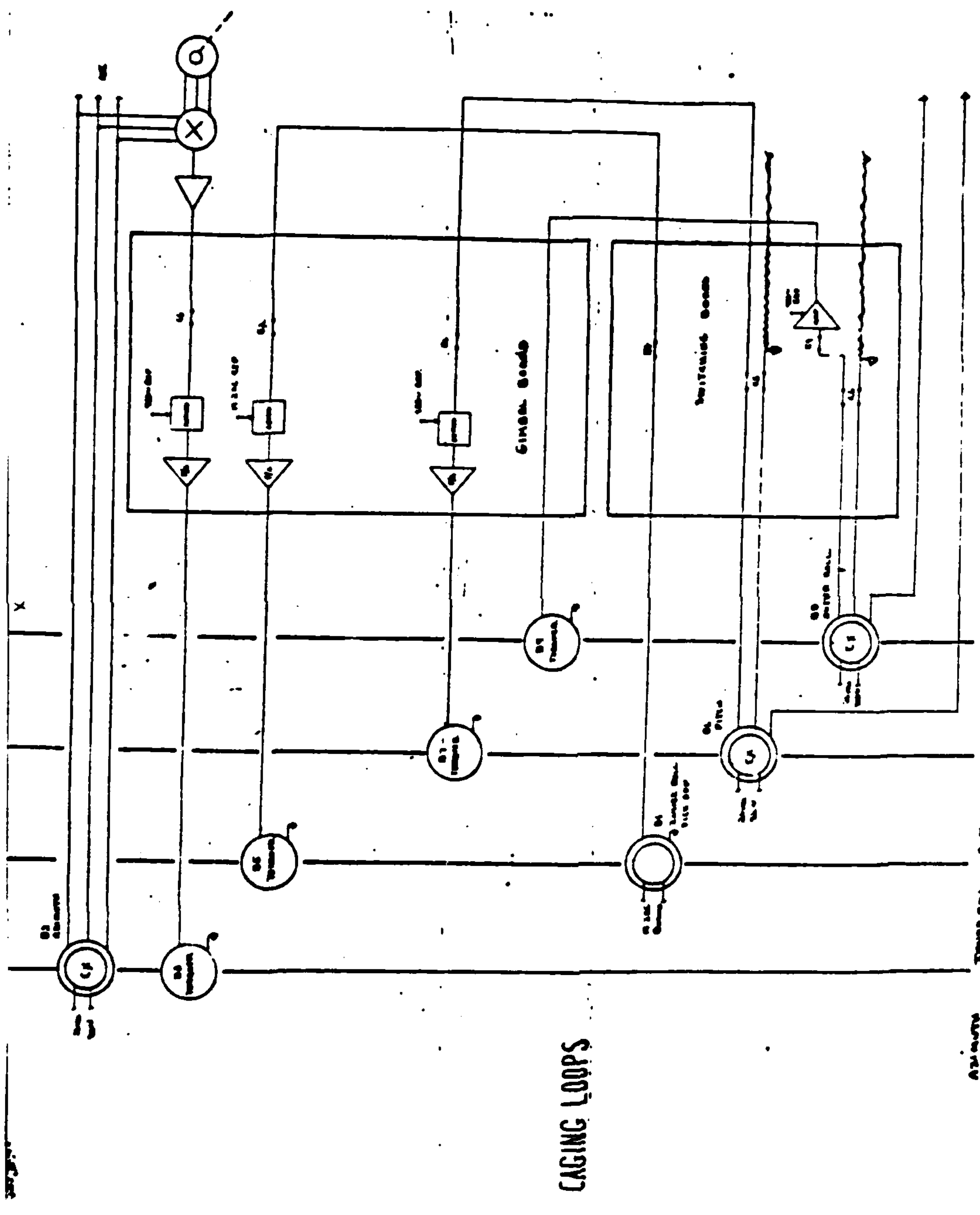
BASIC STABLE PLATFORM



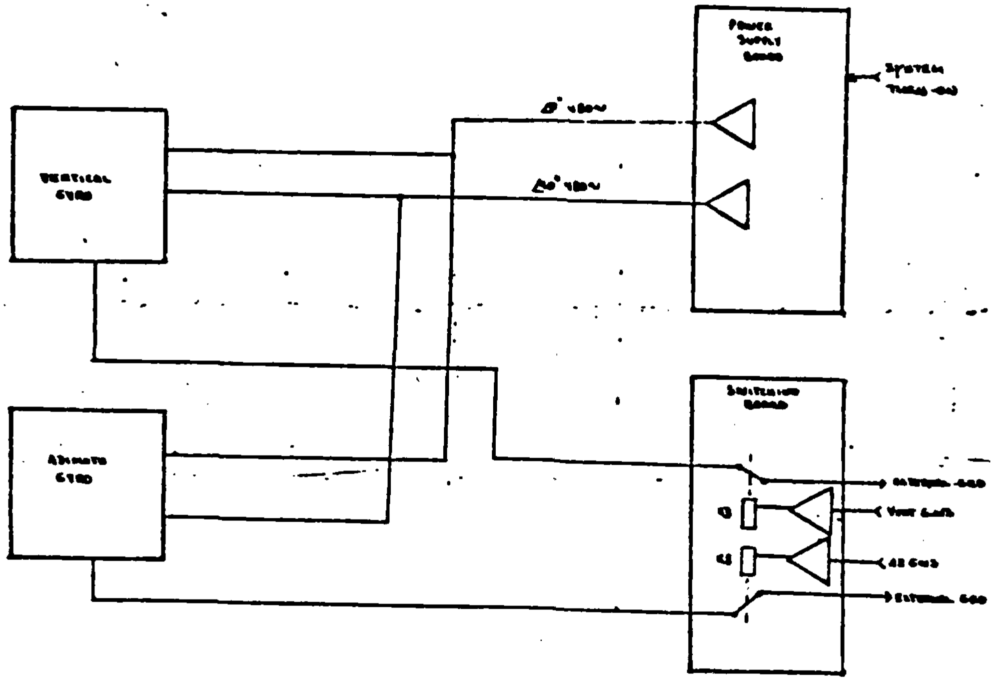
Legend

A1- Two Axis Accelerometer (X, Y)
A2-Single Axis Accelerometer (VERT)
CX-Synchro Transmitter
CR-Coordinate Resolver
MP1- Vertical Gyro (X, Y)
MP2-Azimuth Gyro (Z, RED)
PO-Inner Roll Pickoff
T-Gimbal Torquer

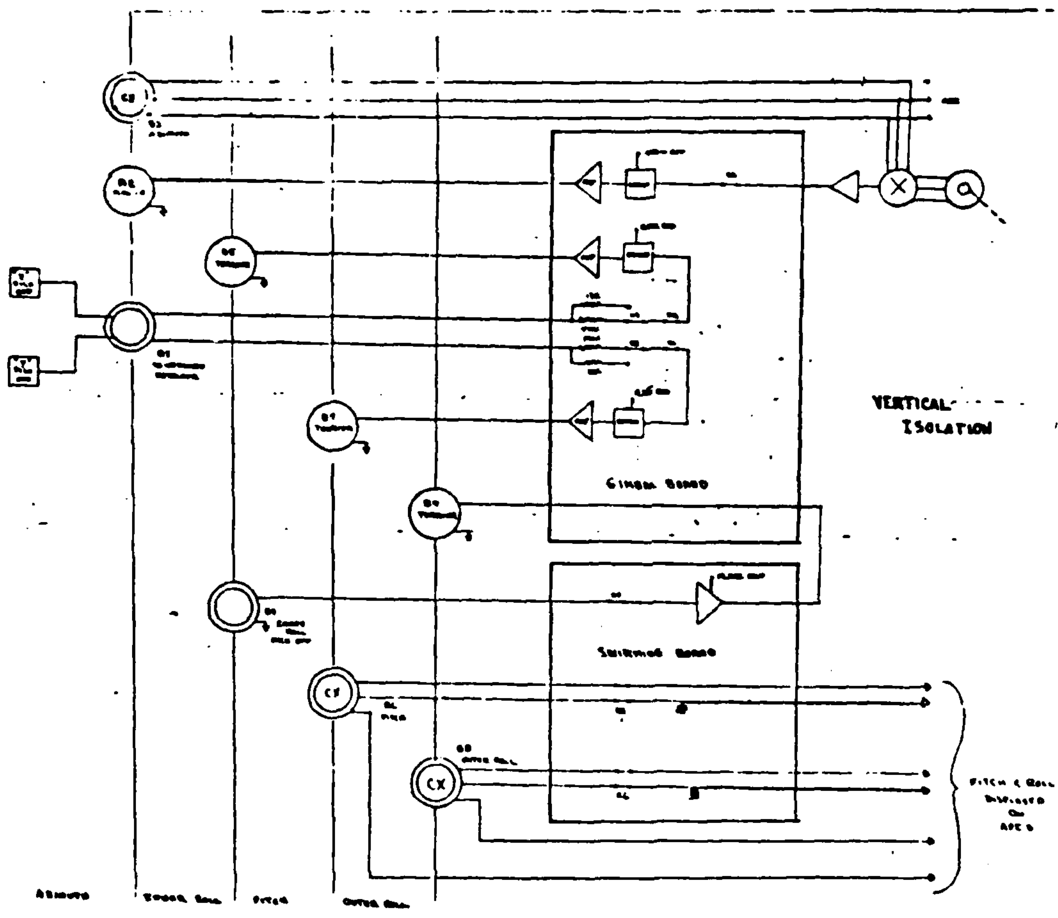

VERTICAL GYRO SPIN AXIS
DUAL AXIS ACCEL
VERT GYRO
PITCH AXIS
.990
1.288
1
2
3
K12
(A) Xa
K11
(B) Ya
K10
K9
Za
K13
K14
.500
A
B
C
SINGLE AXIS ACCEL.
NOTE: ONLY POSITIVE MISALIGNMENT ANGLES SHOWN
+X CLUS AXIS
AZIMUTH (YAW) AXIS
+Z CLUSTER AXIS DOWN
(My) X GYRO INPUT AXIS
K2
Xg
(Mx) Y GYRO INPUT AXIS
Yg
K4
K3
ROLL AXIS
+X
+Z
+Y
AZ GYRO
ZIMUTH GYRO SPIN AXIS
EAST
+Y CLUSTER AXIS
K6
K8
(Mx) Z GYRO INPUT AXIS
Zg



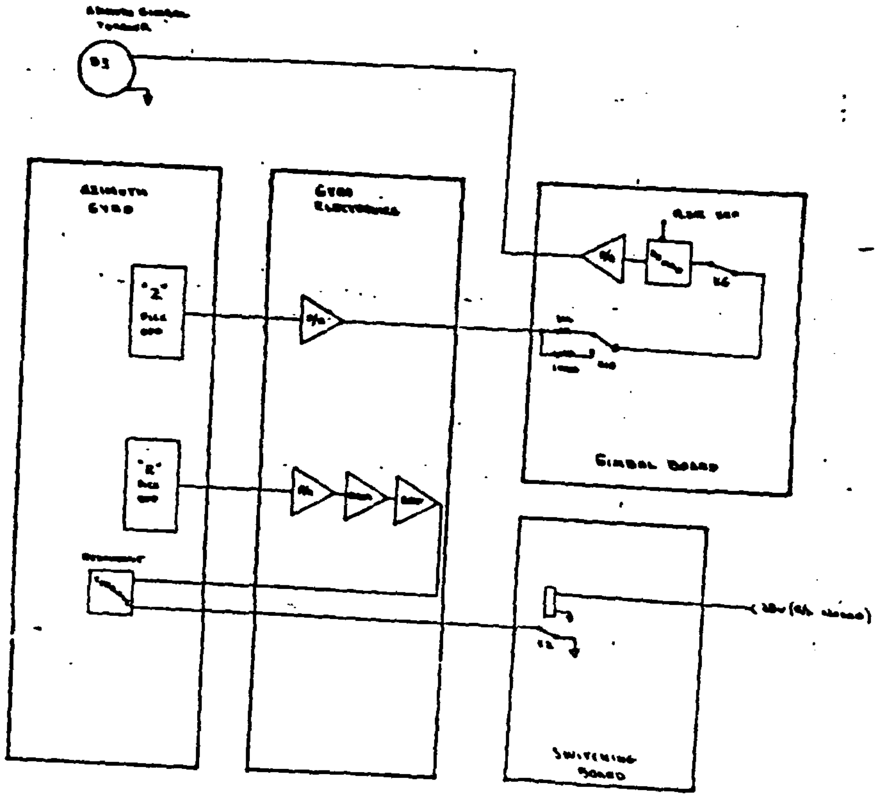
CAGING LOOPS



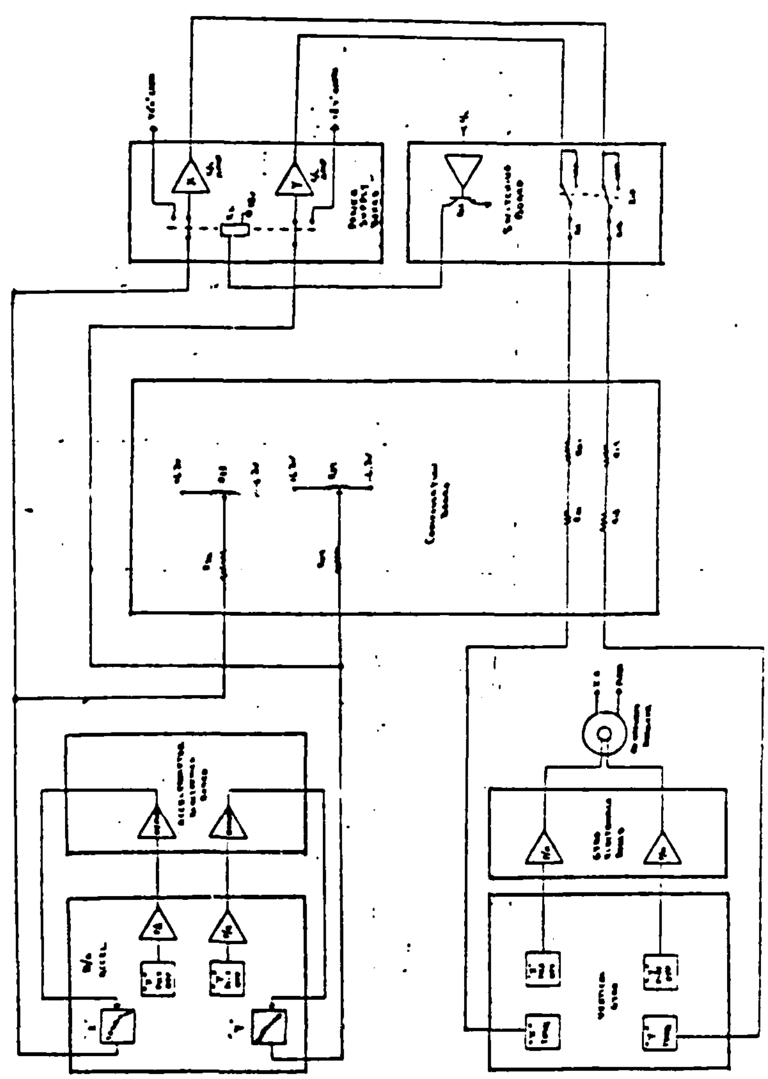
VERTICAL GWS
AZIMUTH GWS



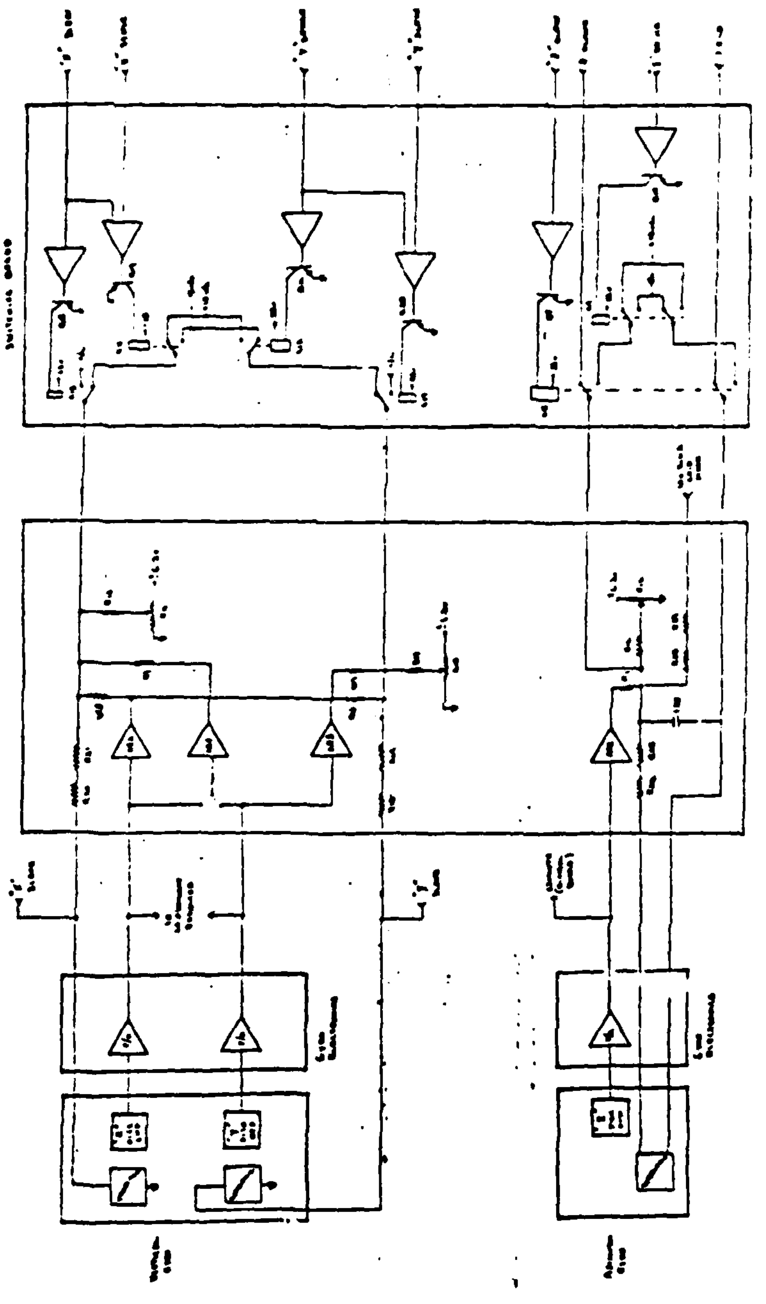
VERTICAL
ISOLATION



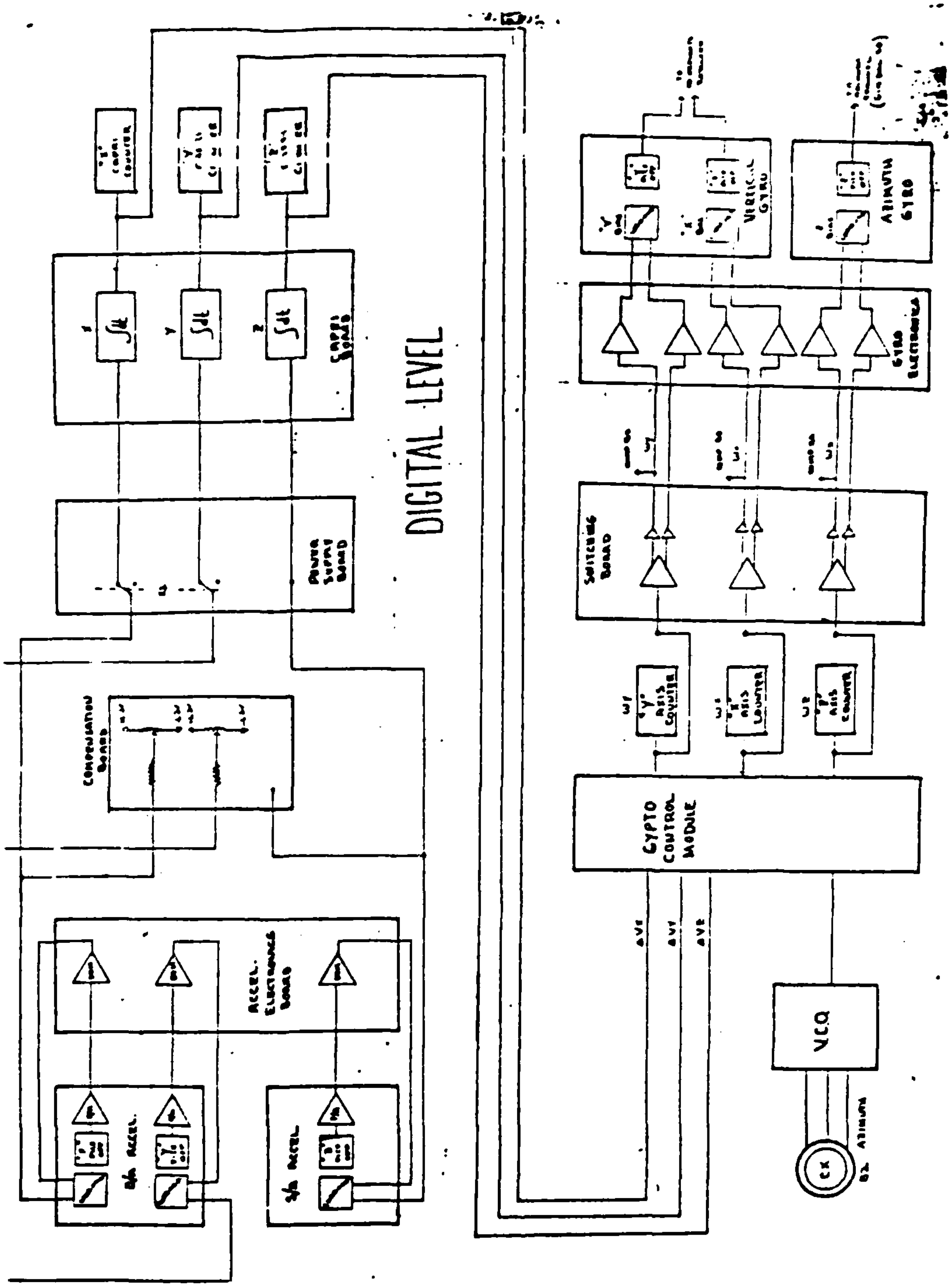
AZIMUTH ISOLATION



COARSE & BACK-UP LEVEL



ALIGN NORMAL
SLEW & SLAVE

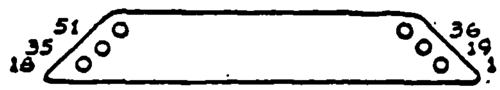

DIGITAL LEVEL
VCO

VIEW OF A7 PLATFORM

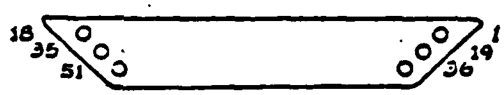
P1, P10, J5, J6 CONNECTORS
WITH CORRESPONDING PIN LOCATIONS

VIEW OF P1 CONNECTOR
LOOKING TOWARDS
COMPENSATION BOARD

VIEW OF J6 CONNECTOR
LOOKING AT IMU HOUSING

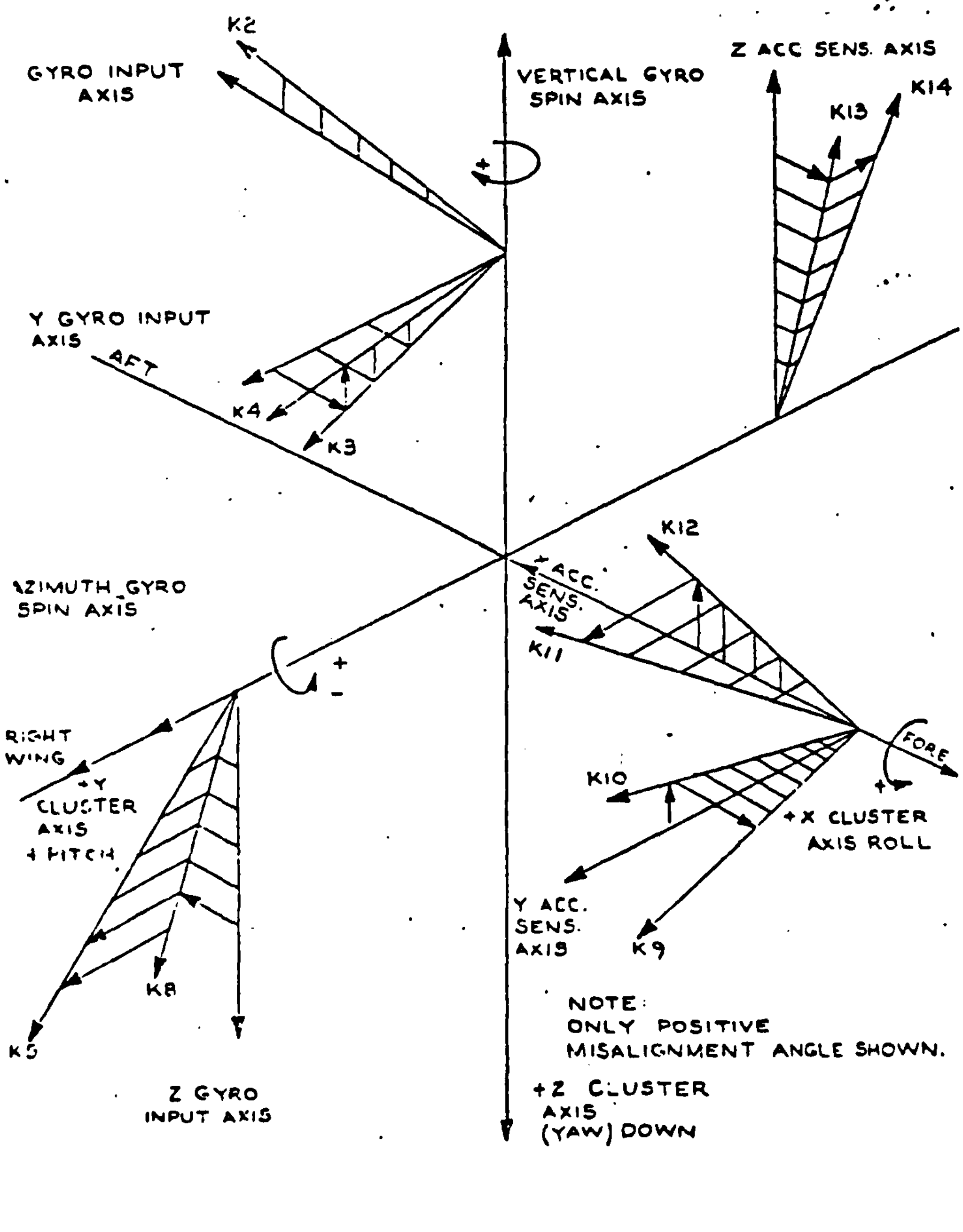


VIEW OF J5 CONNECTOR
LOOKING AT IMU HOUSING

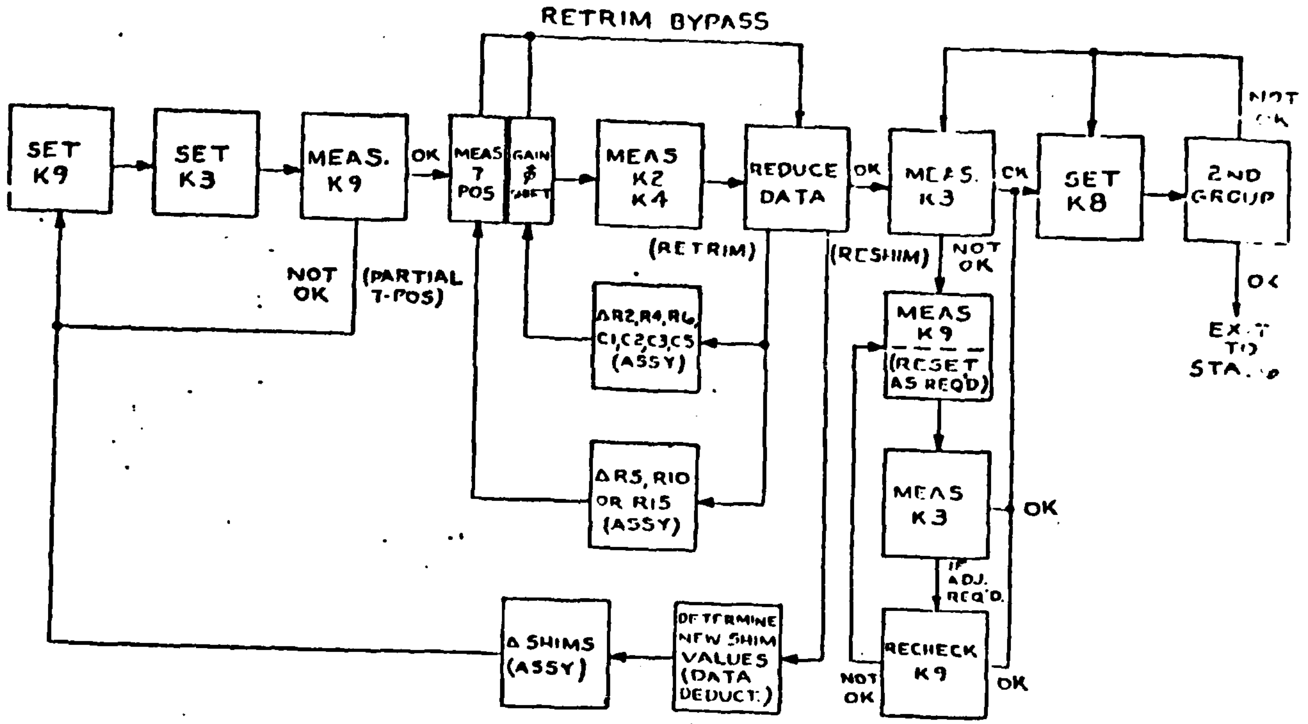


VIEW OF P10 CONNECTOR
LOOKING TOWARDS COMPENSATION
BOARD

PLATFORM MISALIGNMENT ANGLE DEFINITION



SEQUENCE OF ALIGNMENT - A-7 CLUSTER



GIMBAL COMPONENT & AXES ORIENTATION

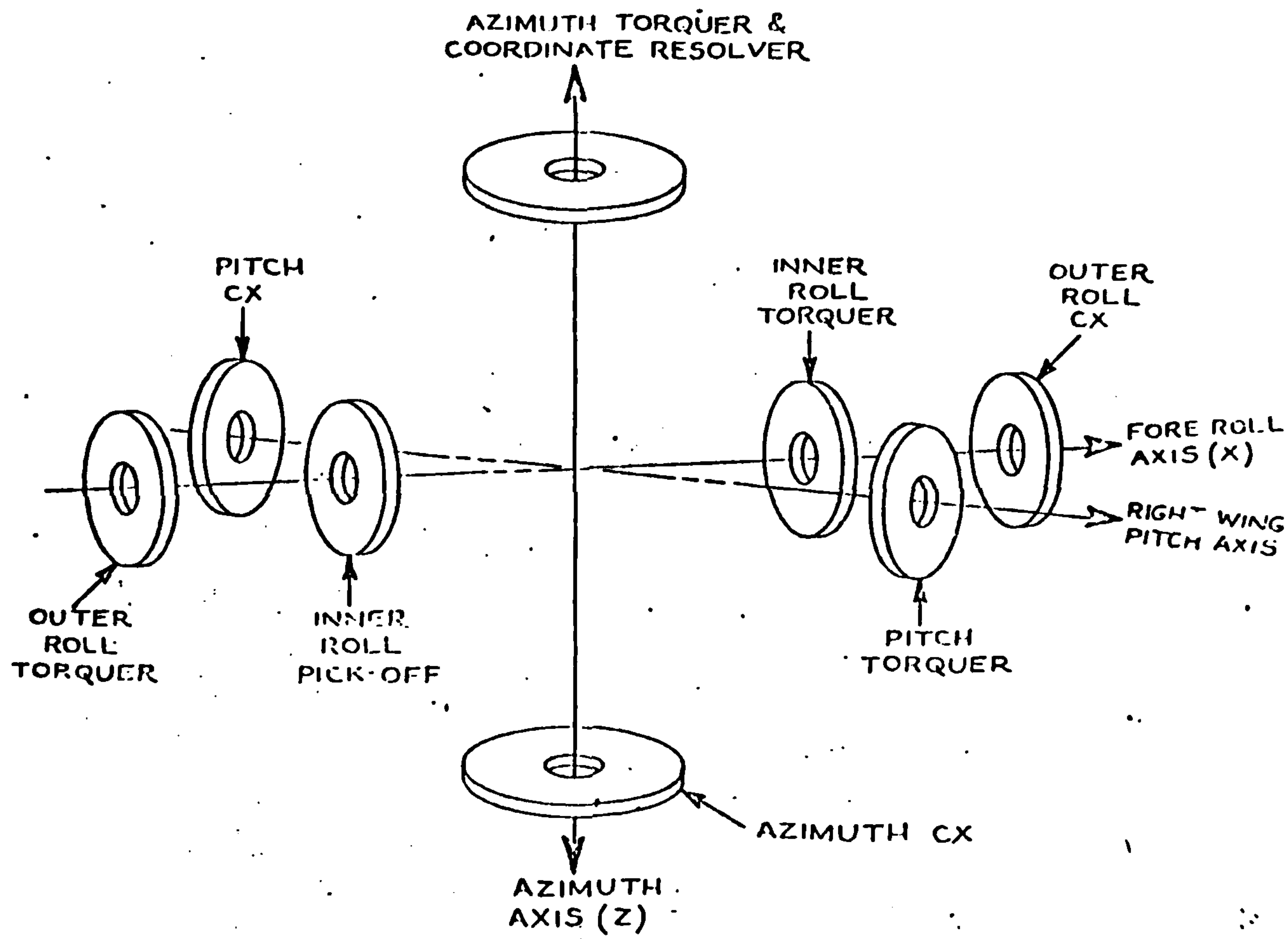


TABLE XIII

AUTOMATIC IMS TESTING FAIL NUMBERS

BASIC TEST	FAIL NO. PRI*	FAIL NO. SEC	INDICATED FAULT
A	1		IMS failed and/or IMS System ready not indicated
B	2		IMS ground align mode not indicated
C	5		IMS self contained analog level incorrect
D	6		IMS self contained hdg loop initialization incorrect (Mag Var difference of 10° not indicated)
E			Accelerometer X and Y null bias & vertical accel. 1"G" bias not within prescribed limits:
	7		X accel/CAPRI high gain null bias out of tolerance
	8		Y accel/CAPRI high gain null bias out of tolerance
	9		X accel/CAPRI low gain null bias out of tolerance
	10		Y accel/CAPRI low gain null bias out of tolerance
	11		Z accel/CAPRI 1"G" bias out of tolerance
	27		X and/or Y accel/CAPRI low gain output saturated
F			Continuous platform slew condition:
	12		Continuous platform slew in X and/or Y axes
	13		Continuous platform slew in azimuth axis
G	17		IMS not under computer control:
		14	No response to positive X & Y slew commands (X & Y accel measurements)
		15	No response to positive Az slew commands (Az synchro measurement)
		16	No response to positive Az slew commands (mag hdg synchro measurements)
	3		Y slew sense malfunction (slews in one direction only)
	4		X slew sense malfunction (slews in one direction only)
	69		Continuous computer control
H			Azimuth slew function malfunctions and/or hdg synchro signals invalid:
		18	Positive Az slew malfunction
		19	No response to negative Az slew commands (Az synchro measurement)
		20	No response to negative Az slew commands (mag hdg synchro measurement)
		21	Negative Az slew malfunction
	22		Platform Az synchro invalid

TABLE XIII (Continued)

BASIC TEST	FAIL NO. PRI*	FAIL NO. SEC	INDICATED FAULT
	23		Mag hdg synchro invalid
	24		No Az slew function
	25		Azimuth slew sense malfunction (slew in one direction only)
I	26		Malfunction of auto reversion to and/or operation of backup grid mode (plat hdg • mag hdg)
J	31		Fast magnetic heading update malfunction:
		29	Fast mag hdg update response rates not indicated (plat Az synchro measurement)
		30	Fast mag hdg update response rates not indicated (mag hdg synchro measurement)
K	34		Malfunction of auto reversion to and/or operation of backup mag slave mode (land only):
		32	Response rates not proper for mag slave mode (plat Az synchro measurement)
		33	Response rates not proper for mag slave mode (mag hdg synchro measurement)
L			Malfunction of X & Y slew functions and/or accel/CAPRI signals and/or roll & pitch attitude signals:
		35	Improper response to + X slew commands (roll synchro measurement)
		36	Improper response to + Y slew commands (pitch synchro measurement)
		37	Improper response to + Y slew commands (X low gain accelerometer measurement)
		38	Improper response to + X slew commands (Y low gain accelerometer measurement)
		39	Improper response to + Y slew commands (X high gain accelerometer measurement)
		40	Improper response to + X slew commands (Y high gain accelerometer measurement
		41	Positive X slew malfunction
		42	Positive Y slew malfunction
		43	Improper response to -X slew commands (roll synchro measurement)
		44	Improper response to -Y slew commands (pitch synchro measurement)
		45	Improper response to -Y slew commands (X low gain accelerometer measurement)
		46	Improper response to -X slew commands (Y low gain accelerometer measurement)
		47	Improper response to -Y slew commands (X high gain accelerometer measurement)

ENGINEERING DEPARTMENT SPECIFICATION

TABLE XIII (Continued)

BASIC TEST	FAIL NO. PRI*	FAIL NO. SEC	INDICATED FAULT
		48	Improper response to -X slew commands (Y high gain accelerometer measurement)
		49	Negative X slew malfunction
		50	Negative Y slew malfunction
	51		Positive Y accel/CAPRI malfunction
	52		Neqavive Y accel/CAPRI malfunction
	53		Y accel/CAPRI malfunction
	54		Negative X accel/CAPRI malfunction
	55		Positive X accel/CAPRI malfunction
	56		X accel/CAPRI malfunction
	57		Accelerometer scale factor change function malfunction
	58		Roll synchro invalid
	59		Pitch synchro invalid
	60		No X slew response
	61		No Y slew response
M			Gyro digital torquing function malfunctions:
	62		GYRO clock line malfunction (open/short)
	63		Positive Y torque malfunction
	64		Negative X torque malfunction
	65		Negative Y torque malfunction
	66		Positive X torque malfunction
	67		Positive Az torque malfunction
	68		Negative Az torque malfunction
N	70		Vertical accel/CAPRI malfunction

*Primary fail numbers underlined are critical failures which discontinue testing.

APPENDIX B

G078C REPORTS - "AIRCRAFT LISTING" AND "FIELD OPERATING HOURS (FOH) BY CYCLE - QUARTERLY"

Explanation. The appendix contains extracts from the "Aircraft Listing" and "Field Operating Hours (FOH) by Cycle - Quarterly" G078C reports. The listings are prepared by unit serial number (second column) and cycle number (first column). Failure data for units in the sample were taken by serial number for Cycle 1 (underlined entries). Actual times to failure (hours) were taken from the column labeled "ETI IN," the elapsed time indicator reading.

PREPARED 82 MAY 20

D-E-L-I-S R-E-P-O-R-T CAN.B 118
MASTER LIST KT-73 (AF) PREPARED MAY 1982

RE CY	FLAT-SN	DATE RECD	BAS L K	ETI IN	ETI OUT	HRS	SHIPD AIL	BAS SH IP	W-D	350 H M	612 H M	612 A T	TAG
01	AFCK550	76117	HJL	0355	0077		76120	HJL			246	A	1900000119
01	AF00001	71314	MIL	0099	0177	0000	72033	MIL					
02	AF00001	72062	MIL	0224	0260	0027	72077	TIN			799	B	1104508696
03	AF00001	72109	MIL	0271	0342	0011	72129	ENG					
04	AF00001	72200	MIL	0388	0493	0044	72292	TIN					
05	AF00001	72327	TIN	0475	0532	0022	72333	TIN					
06	AF00001	73103	EGL	1100	1139	0593	73220	DMN		037	086	F	1701432773
07	AF00001	74110	MIL	1352	1393	0213	74142	MIL			051	G	
08	AF00001	76245	MCE	2471	2514	1070	77009	EGL	F	654	FBA	F	2150431230
09	AF00001	76003		2776	2832	0264	78025				CAO	F	0999999999
01	AF00002	72027	MIL	0229	0313	0000	72108	TIN			799	B	0184921542
02	AF00002	72341	KUR	0496	0559	0183	73005	EGL					
03	AF00002	73072	EGL	0568	0603	0009	73121	KUR		824	615	F	0611253259
04	AF00002	74023	MIL	0765	1797	0162	74330	ENG		242	DBN	F	0172824959
05	AF00002	75304	ENG	2155	2195	0358	75315	HJN	D	255	677	A	2621251085
01	AF00003	72350	KUR	0515	0648	0000	73064	ENG					
02	AF00003	74267	ENG	1067	1087	0439	74288	ENG		656	246	A	2480463026
03	AF00003	76343	ENG	1759	1802	0672	77014	MCL	D	657	FBS	F	3351306583
04	AF00003	77116	MCE	1837	1877	0035	77130	PIT	D	653	CAN	G	0750261756
01	AF00004	71320	MIL	0127	0182	0000	71364	DMN					
02	AF00004	72112	MIL	0184	0295	0002	72156	MIL					
03	AF00004	73026	KUR	0546	0595	0253	73081	ENG		242	127	G	0052814406

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PREPARED [illegible] DAY 20 — B-L-I-S R-E-P-O-R-T — MASTER LIST KT-73 (AF) PREPARED MAY 1982 — CAN # 11

SE CT	FLAT-[illegible]	DATE RECD	[illegible]	ETI IN	ETI OUT	[illegible]	SERVO ATE	[illegible]	W-D	350 H M	612 H M	612 A T	TAG
04	AF[illegible]0004	74133	HOC	0131	0926	0236	74189	KIR		242	KAF	F	1290551352
05	AF[illegible]	74[illegible]	[illegible]	1337	1130	0111	75041	[illegible]		654	TAD	F	2761035684
06	AF[illegible]0004	75[illegible]	[illegible]	1107	1242	0007	75092	[illegible]	D	255	246	A	0570521030
07	AF[illegible]0004	75161	[illegible]	1363	1403	0121	75169	[illegible]	D	958	CAQ	G	1500550159
08	AF[illegible]0004	75307	KIR	1434	1402	0031	75335	TIN		UNK	ABS	F	NO 350 TAG
09	AF[illegible]0004	77003	HON	1355	1332	0373	77019	[illegible]	D	654	NPT	G	3357504230
10	AF[illegible]0004	77[illegible]	[illegible]	1773	2[illegible]	0041	770[illegible]	[illegible]	D	657	052	G	0561266589
11	AF[illegible]0004	77217	[illegible]	2154	2220	0141	77225		D	958	066	A	NO JCN NR.
12	AF[illegible]0004	78[illegible]		2252		0032	78209						
01	AF[illegible]0005	72[illegible]	[illegible]	0121	0235	0000	72165	[illegible]			799	B	3562806736
02	AF[illegible]0005	72335	[illegible]	0302	0326	0027	72341	[illegible]					
03	AF[illegible]0005	74[illegible]	[illegible]	127[illegible]	1303	0069	74155	[illegible]			TAD	F	1540000963
04	AF[illegible]0005	74[illegible]	[illegible]	1366	1441	0003	74196	[illegible]		799	051	G	1562595231
05	AF[illegible]0005	74[illegible]	[illegible]	1445	1510	0004	74249	[illegible]		290	PDS	G	2021550900
06	AF[illegible]0005	75[illegible]	[illegible]	1556	1550	0040	75073	[illegible]	D	652	KHA	F	0630511933
07	AF[illegible]0005	75[illegible]	[illegible]	1759	1616	0109	7[illegible]90	[illegible]	D	654	AAC	G	2670501829
08	AF[illegible]0005	76[illegible]	[illegible]	1334	1033	0018	76[illegible]	[illegible]	D	656	799	B	3511[illegible]
09	AF[illegible]0005	76[illegible]	[illegible]	1378	1993	0035	76103	[illegible]	D	652	799	B	0792565652
10	AF[illegible]0005	77[illegible]	[illegible]	2204	2262	0201	77304		F	958	CPA	G	2080507047
01	AF[illegible]	73[illegible]	[illegible]	0355	0072	0000	73236	[illegible]		242	334	G	1912815603
02	AF[illegible]	75[illegible]	[illegible]	124[illegible]	1[illegible]	0349	75135	[illegible]	D	653	799	B	0781263069
03	AF[illegible]	76[illegible]	[illegible]	1393	1435	0119	77326		S	UNK	062	F	NO JCN NR.

PCN [illegible] — PAGE 3

FI LN	FLAT-SN	DATE RECD	BAS E R	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
04	AF000006	78347	TIN	1709	1773	0223	79079						
01	AF000007	72311	DMN	0349	0390	0000	72332	TIN			800	B	2860435021
01	AF000008	72353	MIL	0467	0513	0000	73031	KUR			799	B	
02	AF000008	73066	KUR	0534	0558	0021	73134	DAN		255	086	K	0742816877
03	AF000008	73172	DMN	0572	0612	0014	73214	KUR		654	086	A	1570597811
04	AF000008	73254	KUR	0624	0671	0012	73292	MIL		242	246	A	2322986935
05	AF000008	74030	MIL	0706	0739	0035	74063	TIN		UNK	UBD	F	0242822685
06	AF000008	74212	KUR	0740	0773	0001	74241	MIL		UNK	086	K	0004234831
07	AF000008	75199	KUR	1052	1092	0279	75209	KIR	D	652	799	B	1622354475
08	AF000008	75352	KIR	1233	1285	0141	76008	KIC		UNK	799	B	3380000000
09	AF000008	76334	KIC	1743	1796	0458	76363	PIT	D	654	246	K	3187500372
10	AF000008	77165	PIT	1917	1947	0121	77180	MIL	D	901	086	K	1474025650
11	AF000008	78103		2146	2203	0199	78289						
01	AF000009	73066	DMN	0556	0610	0000	73127	ENG		654	064	F	0470581679
02	AF000009	75239	ENG	1388	1430	0778	75275	MIL	D	657	UBD	F	2300510283
03	AF000009	76065	MIL	1589	1631	0159	76091	MIL	D	657	246	A	0752801239
04	AF000009	76155	MIL	1540	1689	0009	76181	EGL	D	374	246	A	1261007202
05	AF000009	76225	EGL	1746	1794	0057	76254	DES	D	958	799	B	2097129664
06	AF000009	76122	DES	1857		0063	78136						
01	AF000010	73264	MIL	0852	0936	0000	74063	TIN		037	051	F	2772523224
02	AF000010	74209	UBD	1045	1081	0109	74227	MIL		UNK	799	B	0004221692
03	AF000010	74297	MIL	1099	1103	0018	74310	MIL		255	799	B	2912820422

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MASTER LIST KT-73 (AF) PREPARED MAY 1982 . . . . CAN # 11

SE QY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS SHIP	W-U	350 H M	612 H M	612 A T	TAG
04	AF00010	75176	MIL	1130	1168	0027	75181	TIN	U	657	246	A	1612800514
05	AF00010	76204	MCL	1512	1542	0344	76238	EGL	U	901	ECF	G	1960291494
06	AF00010	76313	EGL	1558	1594	0016	77005	DES	A	958	NPC	G	2897117793
01	AF00011	72054	DMN	0260	0302	0000	72066	DMN					
02	AF00011	78074	ENG	2024		2522	78087						
01	AF00012	72111	DMN	0181	0226	0000	72122	ENG					
02	AF00012	77073	MIL	2611	2693	2385	77087	EGL	U	654	799	B	0561351522
01	AF00014	74126	MIL	0732	0333		75042	MIL		242	CBA	F	1222802863
02	AF00014	76036	MCL	0575	0621	0242	76086	TIN	A	255	FBD	F	NO JCN NR.
03	AF00014	76336	EGL	0933	1014	0312	77038	ENG	U	958	MBN	F	3247146403
04	AF00014	77066	ENG	1061	1091	0047	77097	SFS		656	086	C	NO 350 TAG
05	AF00014	76093		1115	1161	0024	78100						
01	AF00015	77260	TIN	1837	1679		77306		S	241	FBA	F	NO JCN NR.
02	AF00015	78056	ENG	1912	1940	0033	78110						
01	AF00016	72327	KOR	0182	0216	0000	72339	KOR					
02	AF00016	73016	KOR	0291	0333	0075	73038	KOR		374	246	A	3032809236
03	AF00016	73123	KOR	0445	0485	0112	73165	TIN		242	246	A	1052835936
04	AF00016	76356	EGL	1022	1080	0537	77016	ENG	U	037	C3E	G	3481611796
05	AF00016	77296	ENG	1256	1304	0176	77304		U	658	AUQ	G	2734458657
06	AF00016	78065	ENG	1365	1405	0061	78072						
07	AF00016	78130		1420	1449	0015	78130						
01	AF00017	73085	KOR	0506	0556	0000	73134	DMN		654	169	G	0522810755

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MASTER LIST KT-73 (AF) PREPARED MAY 1982

CAN # 1

RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 M M	612 H M	612 A T	TAG
01	AF00018	72214	MIL	0107	0137	0000	72224	MIL		799			2091599109
02	AF00018	72333	KOR	0193	0232	0056	73008	KOR		242			3082804343
03	AF00018	73002	KOR	0316	0421	0084	73141	DMN		631	246	A	0422879672
04	AF00018	73310	DMN	0478	0535	0057	73340	KOR		958	799	B	2947000693
05	AF00018	74084	KOR	0653	0769	0118	74109	TIN			051	F	
06	AF00018	75078	ENG	0769	0829	0020	75118	KIK	Y	799	246	K	0722250955
07	AF00018	75203	KIK	0847	0861	0018	75211	TIN	D	290	799	B	1560008278
01	AF00020	73037	KOR	0498	0539	0000	73086	ENG		255	127	F	0232814202
02	AF00020	74264	ENG	1092	1152	0553	74289	ENG		255	FBA	F	2080549006
03	AF00020	75071	ENG	1190	1251	0038	75099	MIL	D	652	799	B	0590451263
04	AF00020	75150	MIL	1288	1329	0037	75161	ENG	D	657	246	A	1342803951
05	AF00020	75343	ENG	1462	1512	0133	76051	ENG	D	654	FBD	F	3301273222
06	AF00020	76086	ENG	1524	1545	0012	76093	MIL	D	654	799	B	0761254052
07	AF00020	76139	MIL	1564	1603	0019	76163	MIL	D	657	ADJ	G	1272852290
08	AF00020	76169	MIL	1633	1675	0030	76219	EGL	D	UNK	799	B	NO 350 TAG
09	AF00020	77062	EGL	1781	1824	0106	77082	EGL	D	657	799	B	0485118376
10	AF00020	78010	EGL	2005	0027	0181	78044		D	958	862	F	0045067131
11	AF00020	78152		0062		0035	78159						
12	AF00020	78326		0163	0210	0183	78332						
01	AF00021	73172	MIL	0492	0530	0000	73183	KOR		653	246	K	1622810521
02	AF00021	74162	KOR	0936	0977	0406	74192	MIL		UNK	799	B	0004186704
03	AF00021	76173	PAT	1656	1702	0081	76196	MIL	D	037	799	B	1554017329

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B-L-I-S R-E-P-O-R-T
MASTER LIST KT-73 (AF) PREPARED MAY 1982 ....CAN # 1

RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
04	AF00021	77259	SUU	2091	2169	0389	77286		D	943	TSD	G	2322603106
01	AF00022	74007	KOR	1089	1183	0000	74066	KOR		242	051	F	3480908406
02	AF00022	74134	KOR	1253	1321	0070	74193	KIR		242	799	B	1170636983
03	AF00022	75015	KIR	1412	1456	0091	75023	KIR		654	799	B	3401036144
04	AF00022	76021	KIR	1824	1883	0368	76061	DMN	D	654	LBA	F	3581026689
01	AF00023	76036	MCE	1406	1467		76058	KIR	D	255	MSM	C	NO JCN NR.
02	AF00023	76344	KIR	1714	1819	0247	77061	PIT	D	654	CBD	F	3231027824
03	AF00023	77157	PIT	1893	1930	0074	77175	LTV		UNK	799	B	NO 350 TAG
04	AF00023	77276	LTV	1973	2021	0043	77285			UNK	799	B	NO 350 TAG
05	AF00023	78333	TIN	2064	2108	0043	79031						
01	AF00024	73319	KOR	1099	1141	0000	73354	KOR		UNK	EBA	F	0003327280
02	AF00024	74094	KOR	1171	1230	0030	74154	KOR			KBE	F	0652505064
03	AF00024	74217	KOR	1242	1274	0012	74252	MIL		UNK	086	A	1220115983
04	AF00024	75021	KIC	1339	1373	0065	75045	ENG		607	WBF	F	0027503814
05	AF00024	76029	ENG	1539	1591	0166	76041	TIN	D	255	ASQ	G	0221308615
06	AF00024	76097	EGL	1601	1656	0010	76106	ENG	Y	958	799	B	0647126383
07	AF00024	76245	ENG	1743	1786	0085	76267	MIL	D	656	799	B	2336071157
08	AF00024	76329	MIL	1810	1912	0024	77018	EGL	Y	799	AAQ	G	2682003759
09	AF00024	78005		1927	1973	0015	78072				UBD	F	0090000009
10	AF00024	78200		2076		0103	78220						
11	AF00024	78339	TUC	2252	2288	2252	78346						
01	AF00025	74133	DMN	0326	0903		74182	MIL		958	CDQ	G	1190553032

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B-L-I-S R-E-P-O-R-T
MASTER LIST KI-73 (AF) PREPARED MAY 1982. CAN # 11.

FE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-U	350 HM	612 HM	612 AT	TAG
02	AF00025	74199	MTL	0919	0962	0016	74225	KUR		607	246	A	1922823581
03	AF00025	75015	KUR	1132	1177	0170	75022	ENG		UNK	799	B	3030817008
04	AF00025	75184	ENG	1352	1391	0175	75237	ENG	D	655	AAQ	G	1750501256
05	AF00025	76007	ENG	1483	1530	0092	76019	KIR	D	655	799	B	3541307550
01	AF00026	72242	DMN	0164	0259	0000	72266	EDW			037	F	
02	AF00026	73144	NEL	0346	0394	0089	73220	ENG		UNK	070	F	0003183230
03	AF00026	75115	KIC	0934	0973	0540	75204	DMN	A	607	EBA	F	0727500811
04	AF00026	75239	DMN	0996	1049	0025	75266	MCE	D	958	AAQ	G	2300548487
05	AF00026	76307	MCE	1393	1444	0344	76334	TIN	D	653	246	A	2740231808
06	AF00026	78270	ENG	1787	1818	0343	78331						
01	AF00027	72353	KUR	0388	0419	0000	73031	ENG					
02	AF00027	75324	ENG	1362	1408	0943	75335	PIT	D	958	799	B	3091258944
03	AF00027	77252	PIT	2081	2114	0673	77258			037	246	A	2284050061
04	AF00027	78305	TIN	2322	2355	0208	78341						
01	AF00028	73170	MTL	0414	0468	0000	73236	KUR		UNK	037	F	1431508554
02	AF00028	73284	KUR	0470	0509	0002	73305	KUR		958	799	B	2552802161
03	AF00028	74227	MTL	0332	0832	0323	74289	KUR		652	CBQ	F	2242513518
04	AF00028	75086	KUR	1043	1082	0211	75118	KUR	D	255	246	A	0670805005
05	AF00028	76131	ENG	1375	1478	0293	76176	EGL		UNK	MBU	F	NO 350 TAG
06	AF00028	76203	EGL	1489	1566	0011	76236	ENG		UNK	799	B	NO 350 TAG
07	AF00028	77019	ENG	1618	1672	0052	77035	HPT	B	652	799	B	0101111235
08	AF00028	77097	TIN	1693	1750	0021	77172	TIN		290	246	A	NO 350 TAG

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B-L-I-S R-E-P-O-R-T
MASTER LIST KT-73 (AF) PREPARED MAY 1982

CAN # 11

RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-O	350 H M	612 H M	612 A T	TAG
09	AF00028	77215	TIN	1794	1831	0044	77228			UNK	246	A	NO 350 TAG
10	AF00028	77260	MCE	1846	1878	0017	77301		Y	290	TBD	F	2351192312
01	AF00029	73052	KUR	0417	0463	0000	73089	NEL		457	160	G	3472843289
02	AF00029	73264	TIN	0697	0737	0234	73319	EGL		UNK	246	A	0003309362
03	AF00029	74196	EGL	0745	0835	0008	74249	DMN		374	YBM	F	1220115983
04	AF00029	76267	DMN	1730	1783	0895	76301	ENG	O	958	799	B	2576512783
01	AF00030	72215	MIL	0103	0165	0000	72237	ENG					
02	AF00030	73096	ENG	0170	0195	0005	73136	ENG		255	799	B	0682406056
03	AF00030	74176	ENG	0649	0693	0454	74212	KUR		UNK	051	G	0004200731
04	AF00030	76312		1391		1198							
01	AF00031	81496	FCA	4146	4174	0000	81515	—					
01	AF00032	73016	UNI	0334	0364	0000	73035	ENG		354	246	A	3550402141
02	AF00032	77144	MIL	1956	2018	1592	77166	WIL		UNK	FBA	F	NO 350 TAG
01	AF00033	72257	TIN	0109	0143	0000	72272	HIC					
02	AF00033	72348	DMN	0156	0202	0015	73081	ENG			246	A	3140352422
03	AF00033	73211	ENG	0327	0382	0125	74077	KUR		255	FBA	F	1950467524
01	AF00034	72319	NEL	0153	0184	0000	72333	KUR			799	B	2994818910
02	AF00034	73016	KUR	0207	0232	0023	73034	KUR		901	799	B	3492996734
03	AF00034	73360	KUR	0701	0740	0469	74024	TIN		242	246	A	3320910102
04	AF00034	74067	KIK	0742	0797	0002	74064	KUR		290	246	A	0241331781
05	AF00034	76315	MIL	1730	1789	0933	76355	EGL	D	290	LBD	F	3022814711
06	AF00034	77103	EGL	1910	1936	0121	77111	MCE		958	086	K	0905067897
07	AF00034	77200	MCE	1998	2008	0062	77209		A	255	AAQ	G	1750161562

PREPARED 82 MAY 20

B-L-I-S R-E-P-O-R-T
MASTER LIST KT-73 (AF) PREPARED MAY 1982

CAN # 1)

RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
08	AF00034	78016	HJH	2050	2093	0042	78033		D	657	L02	F	3567503914
09	AF00034	78318	TIN	2261	2299	0168	78340						
10	AF00034	79043	SFS	2319		0015							
01	AF00035	72242	DMN	0163	0196	0000	72266	TIN			169	F	
02	AF00035	72326	DDG	0248	0312	0052	72347	KUR			374	F	0760831326
03	AF00035	73302	KUR	0890	0931	0578	73340	MTL		242	051	G	3320910102
04	AF00035	74199	MTL	1133	1192	0202	74226	KUR		657	051	G	1842591590
05	AF00035	75022	KUR	1365	1421	0173	75034	RIC		UNK	246	A	0024001005
06	AF00035	75135	RIC	1455	1517	0034	75181	TIN	B	290	C82	F	1227502136
07	AF00035	76183	MCE	1907	1941	0390	76216	ENG		UNK	AAQ	G	NO 350 TAG
08	AF00035	77123	ENG	2204	2340	0343	77137	KIR	D	652	246	K	1121258016
01	AF00036	72221	DMN	0093	0131	0000	72235	MTL					
02	AF00036	72329	MCL	0168	0198	0037	72343	DMN					
03	AF00036	73057	KUR	0202	0283	0004	73089	ENG		UNK	246	A	3581501756
04	AF00036	75058	RIC	0929	0975	0046	75079	KIR		UNK	070	G	0000000302
01	AF00037	73144	DMN	0483	0517	0000	73193	DMN		656	246	A	1280537920
02	AF00037	73346	DDD	0565	0604	0048	74024	TIN			HDA	G	2234140632
03	AF00037	75107	DMN	0977	1017	0373	75132	DMN	D	958	P50	G	0980461349
04	AF00037	75163	DMN	1075	1141	0058	75181	TIN		UNK	799	B	NO 350 TAG
05	AF00037	78121	SDD	2353	2381	1212	78132						
01	AF00038	73113	DMN	0414	0516	0000	73192	KUR		UNK	246	F	0003152482
02	AF00038	73221	KUR	0539	0581	0023	73236	KUR		242	246	A	2070000598

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RE CY	PLAT-SN	DATE RECD	BAS LK	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 HM	612 HM	612 AT	TAG
03	AF00038	73271	KUR	0592	0631	0011	73296	DMN		799	086	A	2530911314
04	AF00038	73324	DMN	0652	0697	0021	73353	MTL		654	070	G	3060550564
05	AF00038	74023	MTL	0698	0732	0001	74038	TIN		242	A50	G	0041599027
06	AF00038	74067	KIR	0736	0807	0006	74122	DMN			G62	F	
07	AF00038	74255	DMN	0842	0863	0035	74266	ENG		654	246	A	1400553375
08	AF00038	75164	ENG	1234	1262	0371	75202	MTL	D	658	086	A	1750564251
09	AF00038	76076	MTL	1392	1444	0130	76093	KIR	D	657	F8D	F	0642810460
10	AF00038	76181	KIR	1537	1581	0093	76212	MTL	D	UNK	S99	G	NO 350 TAG
11	AF00038	76253	MTL	1591	1631	0010	76300	EGL	D	958	NPC	G	2432803171
12	AF00038	77045	EGL	1659	1707	0028	77055	ENG	F	UNK	799	B	0201502395
13	AF00038	78328	TIN	2390	2418	0083	78340						
01	AF00039	72339	EGL	0451	0482	0000	73018	KUR			799	B	
02	AF00039	73165	MTL	0651	0681	0169	73212	TIN		037	246	A	1562512755
03	AF00039	75224	MTL	1254	0000	0573	75303	ENG	D	652	Y8D	F	2172812600
04	AF00039	76349	ENG	0460	0519	0460	77006	EGL	A	657	AAQ	G	3421115905
05	AF00039	77280	EGL	0799	0840	0280	77300		D	958	NPT	G	2642013579
06	AF00039	78132	ENG	0872	0909	0032	78136						
01	AF00040	72245	ENG	0095	0136	0000	72269	EGL					
02	AF00040	72349	EGL	0185	0223	0049	73024	ENG			799	B	
03	AF00040	74126	LTV	0464	0513	0241	74190	KIR		UNK	246	A	0004165186
04	AF00040	75072	KIR	0767	0925	0254	75139	KIC	D	654	H88	F	0511028790
05	AF00040	75216	KIC	0985	1036	0060	75272	TIN	D	037	H8D	F	1977501705

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B-L-I-S R-E-P-O-R-T
MASTER LIST KT-73 (AF) PREPARED MAY 1982

(CAN #)

RE CY	PLAT-SN	DATE RECD	BAS E R	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
06	AF00040	76126	ENG	1164	1268	0126	76208	MCE	D	656	MBD	F	1171229229
07	AF00040	76336	MCE	1396	1494	0130	77039	MIL	D	654	GBO	F	3080171842
08	AF00040	78173		2030		0536	78181						
01	AF00041	76293	MIL	2045	2095		76324	ENG	D	657	799	B	2822816054
02	AF00041	77025	ENG	2156	2192	0061	77033	DES	D	290	086	A	0201326333
03	AF00041	78174		2690		0498	78181						
01	AF00042	72346	DMN	0254	0476	0000	73172	DMN					
02	AF00042	75237	ENG	1343	1411	0867	75294	ENG	D	658	RBD	F	2440503264
03	AF00042	76139	ENG	1611	1654	0200	76163	DMN	Y	127	086	K	1323250468
04	AF00042	76012	DMN	2588	2703	0934	78030		B	958	799	B	0120000012
01	AF00043	72265	EUR	0141	0185	0000	72271	KER					
02	AF00043	76169	EGL	2095	0005	1910	76223	PIT	D	958	799	B	1757152825
01	AF00044	73106	ENG	0285	0328	0000	73170	HUR		242	160	F	0880002626
02	AF00044	74262	KIR	0336	0447	0508	75077	ENG	D	654	FBA	F	2630028447
03	AF00044	76167	ENG	1365	1431	0918	76198	DMN	D	127	NSM	G	1591255701
04	AF00044	76224	DMN	1446	1488	0015	76254	ENG	D	958	AAS	G	2116557238
01	AF00045	73072	DMN	0426	0498	0000	73114	DMN		654	246	A	0540606369
02	AF00045	73169	DMN	0530	0585	0032	73219	KUR		242	242	F	1550666774
03	AF00045	73261	KUR	0616	0667	0031	74042	TIN		242	LBA	F	2442601084
04	AF00045	74121	MIL	0697	0740	0030	74151	KUR			086	A	0772819223
05	AF00045	76007	KUR	1461	1514	0741	76019	ENG	D	654	246	A	3420608009
06	AF00045	76115	ENG	2226	2270	0712	78135						

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SE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
07	AF00045	78186		2307		0037	78195						
01	AF00046	73264	MIL	0490	0524	0000	73312	MIL		UNK	070	A	0003304363
02	AF00046	74093	OBU	0526	0566	0004	74114	KIR			246	A	0144112154
03	AF00046	75309	KIR	1209	1245	0643	75330	MIL	D	654	FBA	F	2801027861
01	AF00047	72334	ENG	0180	0212	0000	72362	KUK					1676493925
02	AF00047	74068	KUK	0983	1690	0771	74351	KUK		UNK	FBA	F	0722812096
03	AF00047	75094	KUK	1726	1765	0036	75121	KUK	D	654	246	A	0710807059
04	AF00047	76181	DMN	2204	2261	0439	76216	KIR	D	958	246	A	1676493925
05	AF00047	77276	KIR	2676	2731	0417	77300		D	958	FBA	F	2434011272
06	AF00047	78244		2909	2943	0178	78266						
01	AF00048	73144	TIN	0211	0247	0000	73236	KUK		654	NVF	F	0101258722
02	AF00048	73332	KUK	0343	0378	0096	73353	KUK		242	051	G	3102804165
03	AF00048	74052	KUK	0380	0438	0002	74070	KUR		255	246	A	0044001547
04	AF00048	77259	MCE	1740	1764	1308	77270			UNK	NPC	G	2341101099
01	AF00049	72242	EGL	0161	0202	0000	72258	DMN					
02	AF00049	75189	DMN	1199	1243	0997	75231	TIN	D	653	A40	F	1820495730
03	AF00049	76153	ENG	1487	1525	0244	76180	MCE	D	656	DDM	G	1421117839
04	AF00049	77165	MCE	1867	1894	0342	77193			654	ADS	G	NO 350 TAG
01	AF00050	80344	CDA	2764	2803	0000	80351						
01	AF00051	73074	DMN	0434	0466	0000	73115	DMN		242	246	K	0580609313
02	AF00051	74102	KIR	0782	0824	0316	74142	HPT			246	A	
01	AF00052	72264	TIN	0150	0206	0000	73009	KER				A	
02	AF00052	73060	NEL	0232	0265	0026	73136	MIL		290	246	A	0430617984

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MASTER LIST KT-73 (AF) PREPARED MAY 1982

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RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
03	AF00052	76004	PIT	1166	1221	0901	76105	ENG	A	609	LBJ	F	0554001117
04	AF00052	76229	ENG	1367	1393	0146	76260	TIN	D	658	799	B	1421165028
05	AF00052	76356	TIN	1395	1451	0002	77024	MTL	S	242	HBA	F	2016300027
06	AF00052	77161	MTL	1630	1658	0179	77179	MTL	D	657	799	B	1535332225
07	AF00052	78054	SFS	1854	1999	0196	78135		D	127	W4N	F	0410266194
08	AF00052	78275		2074	2108	0075	78285						
01	AF00053	72234	LIV	0109	0151	0000	72243	EGL					
02	AF00053	73196	TIN	0192	0233	0041	73229	WPT		242	246	K	0301255962
03	AF00053	74142	WPT	0319	0355	0066	74150	BUC			070	A	
04	AF00053	76035	BUC	0906	0977	0551	76093	KIC	D	255	CBA	F	0150503202
05	AF00053	77259	KIC	1269	0010	0292	77271		D	037	S99	G	2437505030
01	AF00054	75055	MTL	1001	1039		75065	KUR	D	949	877	A	0442804293
02	AF00054	76161	EGL	1543	1594	0504	76212	EGL	D	958	799	B	1677146874
03	AF00054	78124	EGL	2211	2242	0617	78136						
04	AF00054	78341	KIC	2360		0118	78355						
01	AF00055	80330	NBF	3007	3040	0000	80350						
01	AF00056	72319	NEL	0163	0227	0000	72325	UMN			070	A	3014831819
02	AF00056	75220	PIT	1123	1170	0896	75246	ENG	D	037	CAQ	G	2054006387
03	AF00056	76111	ENG	1401	1450	0231	76120	TIN		UNK	2DM	G	NO 350 TAG
01	AF00057	72334	ENG	0217	0270	0000	73031	KUR			374	F	
02	AF00057	73071	KUR	0330	0367	0060	73109	UMN		624	246	K	0512994046
03	AF00057	75352	UMN	1275	1311	0708	76005	TIN	D	958	J5D	G	3436554008
01	AF00058	74067	ENG	0701	0742	0000	74123	MTL			246	A	0630468011

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MASTER LIST KT-73 (AF) PREPARED MAY 1982

CAN # 1

FL LY	PLAT-SN	DATE RECD	BAS E R	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
02	AF00058	74206	MTL	0774	0810	0032	74275	KIR		242	246	A	1552853546
03	AF00058	75217	KIR	1056	1123	0246	75303	ENG	D	290	LBA	F	1651028280
04	AF00058	77109	ENG	1331	1360	0208	77116	DMN	D	652	ADL	G	1041301588
01	AF00059	73003	EDW	0240	0277	0000	73031	DMN		037	086	A	3240598888
02	AF00059	77226		1952	2024	1675	77243			UNK	070	A	NO 350 TAG
01	AF00060	72300	ENG	0164	0194	0000	72305	TIN					
02	AF00060	73080	ENG	0308	0344	0114	73115	UDO		654	246	K	0580497503
03	AF00060	73191	UDO	0359	0397	0015	73223	KER		UNK	070	A	0046910235
04	AF00060	73285	KER	0404	1213	0007	74080	KUR			FBA	F	0003323197
05	AF00060	74212	KUR	1214	1236	0001	74234	DMN		799	246	A	0984005689
06	AF00060	76224	DMN	1301	1343	0065	77286		D	958	FBA	F	2116551825
07	AF00060	78192		1660		0317	78208						
08	AF00060	79033	TIN	1821	1858	1821	79059						
01	AF00061	74227	EDW	0101	0140		74269	TIN		607	086	K	1940602651
01	AF00062	73301	DMN	0565	0596	0000	74058	TIN		958	DBN	F	3470402308
02	AF00062	74259	MTL	0726	0753	0132	74277	KUR		652	799	B	2382424176
03	AF00062	76246	ENG	1427	1475	0674	76278	ENG	D	656	799	B	2316001360
04	AF00062	77252		1877	1922	0402	77260			UNK	ADQ	G	NO 350 TAG
05	AF00062	78305		2336	2368	0414	78307						
01	AF00063	72249	EDW	0120	0153	0000	72263	ENG					
02	AF00063	76064	ENG	0661	0822	0508	76116	EGL		UNK	FBF	F	NO 350 TAG
03	AF00063	76343	EGL	1025	1072	0201	77005	TIN		958	246	A	3347102295

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MASTER LIST KT-73 (AF) PREPARED MAY 1982

CAN # 11655

SE LY	PLAT-SN	DATE RECD	BAS E R	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-D	350 H M	612 H M	612 A T	TAG
01	AF00064	72319	NEL	0222	0276	0000	72350	TIN			374	K	2864750118
02	AF00064	73264	DMN	0339	0377	0063	73325	DMN		654	799	B	2700426906
03	AF00064	74114	DMN	0524	0574	0147	74158	TIN			246	A	0980483825
04	AF00064	74227	MTL	0575	0577	0001	74263	ENG		242	799	B	1971512967
05	AF00064	75237	ENG	0827	0875	0250	75254	BUC	D	652	051	G	2100511422
01	AF00065	72276	EGL	0122	0157	0000	72290	TIN			374	F	2452503359
02	AF00065	72327	TIN	0162	0184	0005	72333	KUR					
03	AF00065	73254	KUR	0777	0826	0593	73282	NEL		958	246	A	2262979872
04	AF00065	75079	BUC	1295	1333	0469	75114	MTL	D	037	799	B	0670505696
05	AF00065	75209	MTL	1351	1408	0018	75259	KIR	D	657	FBA	F	1702818707
06	AF00065	76281	TIN	1518	1559	0110	76303	MTL		UNK	NSE	G	NO 350 TAG
01	AF00066	73225	EGL	0299	0334	0000	74038	DMN		255	FDA	F	2171252690
02	AF00066	74092	DMN	0368	0409	0034	74112	TIN			CAN	G	0800553844
01	AF00067	73093	LTV	0212	0348	0000	73214	KUR			246	A	2331500406
02	AF00067	73254	KUR	0355	0398	0007	73283	KUR		UNK	246	A	2331500406
03	AF00067	73334	KUR	0405	0451	0007	74003	KUR			799	B	2920908496
04	AF00067	74077	KUR	0453	0499	0002	74091	KUR			246	A	0264105741
05	AF00067	74134	KUR	0507	0545	0018	74218	ENG		UNK	051	G	1150644495
06	AF00067	74337	ENG	0560	0076	0015	75027	ENG		607	C5D	G	2490084243
07	AF00067	75065	ENG	0077	0106	0001	75098	MTL	Y	037	799	B	0492261462
08	AF00067	77064	DES	0618	0660	0512	77129	EDW	D	561	FBD	F	0740006907
09	AF00067	77265	EDW	0776	0830	0116	77272		D	242	AAQ	G	2447518200

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CAN # 11

SE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESH IP	W-U	350 H M	612 H M	612 A T	TAG
10	AF00067	78152	DES	0931	1025	0101	78179						
11	AF00068	72350	MCL	0377	0406	0000	73071	MTL			799	B	3354765285
02	AF00068	73312	MTL	0619	0648	0213	74010	MTL		655	XUM	G	3030825179
01	AF00071	76216	PIT	0129	0186		76247	EGL		UNK	N5D	G	NO 350 TAG
02	AF00071	77020	EGL	0203	0250	0017	77028	SJU	F	958	246	A	0047122364
03	AF00071	77152	SUU	0286	0339	0036	77164	PIT	F	290	246	A	1193361260
04	AF00071	77236	PIT	0437	0450	0098	77243		D	656	799	B	1984052904
05	AF00071	78072	MTL	0698		0240	78081						
06	AF00071	78137		0745	0802	0745	78166						
07	AF00071	78332	TIN	0883		0081	78363						
01	AF00073	78053		0845					D	127	DDD	F	3537502279
01	AF00074	76042	ENG	0122	0156		76056	MTL	Y	169	599	G	0343250737
02	AF00074	76133	MTL	0251	0309	0095	76160	DMN	A	657	086	K	1242427287
03	AF00074	76287	MTL	0415	0437	0106	76321	KIR	D	657	799	B	2792459613
04	AF00074	78072	KIR	0896		0459	78145						
01	AF00075	78016	SHE	0764	0801		78031		D	255	799	B	3560027708
01	AF00077	76182	KIR	0292	0367		76243	KIC	D	958	08D	F	NO 350 TAG
02	AF00077	78016	KIC	0707	0748	0340	78030		D	037	799	B	3567506123
03	AF00077	78201		0826		0078	78216						
01	AF00078	77066	PIT	0365	0485		77116	ENG	D	037	N8D	F	0504025290
02	AF00078	77137	ENG	0498	0601	0011	77182		Y	799	HBA	F	1303315783
03	AF00078	77315	PIT	0681	0725	0080	77325		D	037	799	B	2944076012

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RE CY	PLAT-SN	DATE RECD	BAS E K	ETI IN	ETI OUT	HRS	SHIPD ATE	BAS ESM IP	W-D	350 H M	612 H M	612 A T	TAG
04	AF00076	78061	PIT	0742	0775	0017	78066						
01	AF00079	76324	MIL	0454	0507		76355	DMN	D	652	799	B	3132805761
01	AF00080	77229	MIL	0397	0935		77266		D	657	799	B	2492634745
01	AF00081	81044	KBE	2133	2174	0000	81044						
01	AF00082	77061	MIC	0347	0389		77074	MIL	D	656	246	A	0461350519
02	AF00082	77193	MIL	0516	0566	0129	77266		D	657	GBD	F	1782827595
03	AF00082	77325	DES	0572	0597	0006	77336		D	654	CBQ	F	1260027590
04	AF00082	78053		0612	0640	0015	78074		D	656	FBA	F	0117508872
[illegible]	[illegible]	[illegible]	[illegible]	0780	[illegible]	0140	[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0000	[illegible]						
01	AF00085	77320	UNK	0220	0259	0000	77341			UNK	AAQ	G	3002864323
01	AF00087	76245	ENG	0332	0391		76271	MCE	B	070	246	A	2361007343
02	AF00087	76338	MCE	0409	0458	0018	76352	DES	D	654	799	B	2800041337
03	AF00087	78132	DES	1024		0566	78143						
01	AF00088	[illegible]	MIL	0163	0214		76268	PIT		UNK	NPC	G	ND 350 TAG
01	AF00089	79236	[illegible]	[illegible]	[illegible]	0000	[illegible]						
01	AF00090	77106	ENG	0436	0480		77123	ENG	D	654	NPT	F	0941312123
02	AF00090	77200	MIL	0546	0609	0066	77207		D	255	246	A	1862752927
01	AF00091	76210	DMN	0121	0183		76231	MIL	Y	799	ZDD	G	1777707823
02	AF00091	76313	MIL	0244	0296	0061	76348	PIT	D	657	J5D	G	2927809260
03	AF00091	77130	PIT	0419	0459	0123	77145	KIR	D	654	086	A	1244051781
01	AF00092	76216	EGL	0154	0197		76244	KIC	D	958	799	B	1837164824
02	AF00092	76334	KIC	0273	0304	0076	76363	MIL	D	037	799	B	3157512377
03	AF00092	76219		0979		0675	78298						
01	AF00103	78318	TIN	1510									

AF00093 81021 PIK [illegible]
AF00094 80031 [illegible]

AUC	SYSTEM SER NUMBER	CY	TEST DATE	TEST FDC	TEST A	REPAIR DATE	REPAIR FDC	REPAIR A	VEN	ANL	REPORT NUMBER	MAINT REC DATE	FOH	REC ETI	REP ETI	SHIP ETI	SRAN REC	SRAN SHIP	SRAN REC DATE	SRAN SHIP DATE
73FAO	AF05SSC	01	76115	CGZ	C	76119	246	A	N	V	438973	76117		0855	0877	0877	FB4801	FB4801	76117	76120
73FAO	AFOTST1	01	80061	799	B	80061	799	B		R	027922	80060		1111	1212	[illegible]	[illegible]		80060	[illegible]
73FAO	AFOTST1	02	80070	374	C	80070	C70	F		V	029161	80070	1010	2222	3333	3333	999999		80070	80070
73FAO	AF00001	09	78003	CAG	C	78025	CAG	F	N	U	643757	78003	0264	2778	2832	2832			78003	78025
73FAO	AF00001	10	81318	CGZ	C	81323	CGZ	A		U	072334	81317	1067	3899	3937	3937	999999		81317	81323
73FAO	AF00002	06	80044	EDD	C	80073	EEC	F	N	V	025706	80032	1531	3726	3813	3813	FB4805		80029	80073
73FAO	AF00002	07	81022	799	B	81027	799	B	N	F	046683	81021	0140	3953	3991	3991	FB6563		81021	81027
73FAO	AF00003	05	81014	799	B	81023	799	B	N	R	048130	81014	1315	3192	3234	3234	FB6381		81014	81023
73FAO	AF00003	06	81310	RSD	C	81313	RSD	G		N	071703	81306	0145	3379	3415	3415	FB6352		81306	81313
73FAO	AF00004	13	79325	CCD	C	79327	CCD	F		N	019543	79319	0287	2595	2632	2632	FB2030		79319	79327
73FAO	AF00004	14	80014	37N	C	80014	ADS	G	N	V	022914	80002	0011	2643	2696	2696	FB4805		79361	80014
73FAO	AF00004	15	80184	AAG	C	80210	AAG	G	N	V	037164	80183	0204	2900	2947	2947	FB4805		80163	80210
73FAO	AF00004	16							N			82068	0364	3311			FB6221		82062	
73FAO	AF00005	10	77262	CDC	C	77304	CDA	G	N	V	643830	77259	0261	2204	2262	2262	FB6061		77259	77304
73FAO	AF00006	05	80058	C70	C	80058	C70	G		N	026529	80046	0052	1825	1878	1878	FB6540		80046	80058
73FAO	AF00006	06	80312	AGF	C	81342	GBF	F	N	V	073419	80312	0173	2051	2113	2113	FB6141		80281	81342
73FAO	AF00007	01	72320	ECC	B		800	B	N	U	393547	72318		0349	0390	0390	FB4604	IBM	72318	72322
73FAO	AF00008	13	80087	C70	C	80087	C70	G	N	V	029219	80078	0113	2503	0049	0049	FB4805		80071	80087
73FAO	AF00009	07	79365	C7C	C	79365	C70	F	N	V	022968	79337	0668	2596	2629	2629	FB2823		79337	79365
73FAO	AF00009	08	80253	HBF	C	80256	HBE	F	N	V	040212	80254	0184	2813	2857	2857	FB6563		80248	80296
73FAO	AF00010	07	79347	ADS	C	79347	ADS	G	N	V	021276	79325	1065	2659	0000	0000	FB6141		79325	79347
73FAO	AF00010	08	81099	ADG	C	81099	C70	G		V	054945	81086	0192	0192	0240	0240	FB6355		81086	81099
73FAO	AF00011	02	78087	799	B	00000			N	U	000396	78074	2522	2824	2882	2882	FB4805		78074	78087
73FAO	AF00012	05	79203	TGD	C	79270	TGD	A	N	N	009803	79184	0015	2777	2849	2849	FB6311		79184	79270
73FAO	AF00014	07	79200	CCF	C	79207	CCF	A	N	V	009691	79200	0046	1254	1275	1275	FB4808		79200	79207
73FAO	AF00014	08	80284	EOC	C	80299	AAG	G	N	V	042119	80284	0440	1715	1756	1758	FB6411		80263	80299
73FAO	AF00014	09	81139	799	B	81139	799	B	N	F	058294	81132	0209	1967	1997	1997	FB6022		81126	81139
73FAO	AF00014	10	81318	ACK	C	81328	CGD	A	N	N	072604	81316	0030	2027	2068	2069	FB6461		81302	81328
73FAO	AF00015	04	80311	ECO	C	80330	ADS	G	N	V	043579	80311	0719	2981	3025	3025	FB4808		80311	80330
73FAO	AF00016	08	79222	799	B	00000	CCO	O	N	R	011181	79213	0087	1531	1557	1557	FB2805		79213	79222
73FAO	AF00016	09	82030	ACK	C	82119	XEN	F	N	V	083844	82029	0936	2495	2614	2614	FB6141		81364	82119
73FAO	AF00017	02	81209	CSA	C	81211	CSA	G		V	063760	81201	3308	3864	3889	3888	FB6355		81201	81211
73FAO	AF00018	07	75210	799	B		799	B	N	R	542503	75203	0016	0847	0861	0861	FB2803	FB2039	75203	75211
73FAO	AF00018	08	81336	ACK	C	81344	EGF	G	N	L	073703	81322	0139	1000	1038	1038	FB2039		81316	81344
73FAO	AF00020	13	79200	EBD	C	79260	EBD	F	N	V	009594	79194	0067	0277	0334	0334	FB6563		79194	79260
73FAO	AF00020	14	79306	C70	C	79311	C70	A	N	V	017774	79296	0003	0337	0366	0366	FB6352		79298	79311
73FAO	AF00020	15	80312	ECG	C	80319	GSD	G	N	N	043574	80312	0008	0374	0411	0411	FB6540		80289	80319
73FAO	AF00021	06	79186	37N	C	79233	N00	G	N	V	008638	79193	0010	2566	2655	2655	FB6311		79183	79233
73FAO	AF00021	07	79295			79295			N			79285	0009	2664	2690	2690	FB6563		79285	79296
73FAO	AF00021	08	80109	C70	C	80122	C70	A	N	V	031344	80098	0096	2794	2833	2833	FB6142		80080	80122
73FAO	AF00021	09	80254	ECN	C	80352	FEA	F	N	V	040214	80254	0013	2846	2924	2924	FB6311		80247	80352
73FAO	AF00021	10							N			82049	0049	2973			FB6354		82015	
73FAO	AF00022	04	76016	LBA	C	76058	LEA	F	N	V	559742	76021	0368	1824	1883	1883	FB2803	FB4604	76021	76061
73FAO	AF00022	07	80210	799	B	80210	799	B	N	R	036969	80183	0162	2429	2464	2464	FG6354		80171	80210
73FAO	AF00023	09	82055	CDM	C	82058	CDM	F		U	079605	82054	0281	2745	2755	2755	FB6563		82054	82058
73FAO	AF00024	12	79270	ADG	C	79270	ADG	G	N	V	015414	79248	0223	2511	2555	2555	FB6141		79248	79270
73FAO	AF00025	07				79363			N			79337	0186	2945	2996	2996	FB4805		79331	79363
73FAO	AF00025	08	82075	ACK	C	82088	TSA	A	N	V	081329	82075	0633	3629	3666	3666	FB6352		82070	82088
73FAO	AF00026	07	80123	LCF	C	80123	LCF	G	N	V	031419	80109	0324	2142	2187	2187	FB4805		80059	80123
73FAO	AF00027	06	80112	C70	C	80326	N40	G	N	V	030651	80111	0165	2640	2696	2696	FB6540		80106	80326

WUC	SYSTEM SER NUMBER	CY	TEST DATE	TEST FCC	A	REPAIR DATE	REPAIR FCC	A	V E N	A N	REPORT NUMBER	MAINT REC DATE	FDI	REC ...	REP ETI	SHIP ETI	SRAN REC	SRAN SHIP	SRAN REC DATE	SRAN SHIP DATE
73FAO	AF00031	01	81255	FCA	C	81315	FCA	F		V	071940	81224		4126	4174	4174	FB6355		81254	81315
73FAO	AF00032	02	77146	C51	C	77165	FLA	F	N	V	628333	77144	1592	1956	2018	2018	FE4606	WIL	77144	77166
73FAO	AF00033	03	73225	C37	C	74077	FEA	F	N	V	439000	73211	0125	0327	0382	C382	FB48C5	FB5264	73211	74077
73FAO	AF00034	12	80044	799	B	80044	799	B		R	025728	80039	0046	2582	2616	2616	FB6352		80039	80044
73FAO	AF00034	13	82016	ACK	C	82027	FCD	A	N	V	076794	82015	0236	2852	2904	2904	FB6411		81350	82027
73FAO	AF00035	08	77130	246	K		246	K	N	V	585752	77123	0343	2284	2340	2340	FB4805	FB2803	77123	77137
73FAO	AF00036	05	80106	WDQ	C	80106	WDC	G	N	A	031016	80073	0153	1128	1176	1176	FG6311		80071	80106
73FAO	AF00036	06	81310	CBZ	C	82022	WDC	G		V	076365	81306	C062	1258	1327	1327	999999		81306	82022
73FAO	AF00037	05	78132	799	B	00000			N	U	000529	78121	1212	2353	2381	2381	FB6142		78121	78132
73FAO	AF00038	14	79201	FBA	C	79304	FEA	G	N	V	014099	79254	0131	2549	0021	0021	FB6381		79254	79304
73FAO	AF00038	15	80184	AAO	C	80200	AAC	G	N	V	035029	80163	0244	0265	0324	0324	FB48C5		80163	80200
73FAO	AF00039	07	80044	C70	C	80044	ADE	G		V	025576	80032	0319	1228	1272	1272	FB6061		80032	80044
73FAO	AF00039	08	81314	799	B	81314	799	E		R	071480	81309	0405	1677	1703	1703	FB6563		81309	81314
73FAO	AF00040	09	79258	799	B	79333	799	B	N	F	017067	79297	0480	2544	2577	2577	FG6123		79297	79333
73FAO	AF00040	10	80258	CSJ	C	80261	CSJ	F	N	N	040216	80254	0314	2891	2932	2932	FB48C5		80249	80261
73FAO	AF00040	11										82118	0428	3360			FB6221		82118	
73FAO	AF00041	03							N	U	000000	78174	0498	2690	2745	2745			78174	78181
73FAO	AF00042	05	79260	AGF	C	79264	AGF	A	N	N	014100	79254	0496	3199	3235	3235	FB64C1		79254	79264
73FAO	AF00042	06	81033	GBD	C	81037	FCF	A	N	V	049704	81033	0270	3505	3539	3539	FB2805		81033	81037
73FAO	AF00043	03	80339	FBA	C	80364	FEA	F	N	V	045744	80339	1573	1578	1648	1648	FB6381		80290	80364
73FAO	AF00043	04	81323	AGK	C	81334	CGS	A	N	A	072852	81322	0168	1816	1850	1850	FB6461		81322	81334
73FAO	AF00044	04	76245	DPD	C	76251	AAS	G	N	V	585515	76224	0015	1446	1488	1489	FB4604	FB4805	76224	76254
73FAO	AF00045	C7	78186	NPC	C	78200			N	U	000972	78186	0037	0000	2357	2357	FB4877		78186	78200
73FAO	AF00046	04	80057	CD2	C	80057	CD2	G		N	026481	80043	1295	2540	2589	2589	FB4810		80043	80057
73FAO	AF00046	03										82104	0616	3205			FB6142		82104	
73FAO	AF00047	07	80346	ECO	C	80347	GEA	G	N	V	046024	80336	0491	3434	3477	3477	FB6381		80290	80347
73FAO	AF00047	08	81254	ACK	C	81304	ASS	G		V	070769	81294	0270	3747	3777	3777	FB6142		81254	81304
73FAO	AF00047	09	82062	ACK	C	82071	XEN	G		V	080185	82061	0015	3792	3840	3840	FG6311		82061	82071
73FAO	AF00048	05	81066	CPN	C	81120	FEA	F		U	054542	81085	1003	2787	2830	2830	999999		81085	81120
73FAO	AF00049	04					ADS	G	N	V	000000	77165	0342	1867	1894	1894	FB6401		77165	77193
73FAO	AF00049	05	81309	W4L	C	81310	C4C	G	N	U	071328	81296	1415	3309	3359	3359	FG6381		81296	81310
73FAO	AF00050	01	80351	CDG	C	80351	CDC	G	N	V	046706	80344		2764	2803	2803	FG6401		80308	80351
73FAO	AF00050	02	81307	CPA	C	81311	CFA	A	N	A	071335	81299	0197	3000	3041	3041	FB6311		81299	81311
73FAO	AF00050	03	82106	799	B	82106	799	B		R	082381	82098	0066	3107	3157	3157	FB6381		82098	82106
73FAO	AF00051	02					246	A	N	V	000000	74108	0316	0782	0824	C824	FB2803	FB2300	74108	74142
73FAO	AF00052	08	78265	799	B	00000			N	U	001685	78276	0075	2074	2108	2108	999999		78276	78285
73FAO	AF00053	06	79253	GBF	C	79273	GBF	F	N	V	013506	79247	0849	0867	0924	0924	FB6311		79247	79273
73FAO	AF00054	05	78355	799	B	78355	CCO	O		R	002424	78349	0066	2360	2388	2388	999999		79349	78355
73FAO	AF00055	01	80346	ECO	C	80350	MSF	G	N	N	040027	80338		3007	3040	3040	FB6141		80289	80350
73FAO	AF00055	02	81320	FBE	C	81355	FEE	F		U	074332	81317	0066	3106	0000	0030	999999		81317	81355
73FAO	AF00056	04	79215	FBA	C	79243	FEA	F	N	V	010909	79214	0485	1935	1972	1972	FB6411		79214	79243
73FAO	AF00056	05	79347	C70	C	79347	C70	G	N	N	021274	79337	0072	2044	2097	2097	FB4805		79337	79347
73FAO	AF00056	06	81324	799	B	81324	799	B		F	072389	81317	0045	2142	2172	2172	FB4805		81317	81324
73FAO	AF00056	07	82050	ADK	C	82074	GBD	F	N	U	080317	82049	0003	2175	2225	2225	FB6381		82015	82074
73FAO	AF00056	08										82127	0021	2246			FB6401		82127	
73FAO	AF00057	03	75364	JSD	C		JSD	G	N	V	551605	75352	0908	1275	1311	1311	FB4604	FB2039	75352	76005
73FAO	AF00058	05	80108	FEA	C	80151	FEA	F	N	V	033340	80060	1018	2378	2413	2413	FB6563		80065	80151
73FAO	AF00059	02	77241	CFG	C	77243	C70	A	N	U	628199	77228	1675	1952	2024	2024			77228	77243
73FAO	AF00059	03										81323	1389	3413			FB6061		81323	
73FAO	AF00060	09	79234	LCF	C	79282	LCF	A	N	V	012344	79232	0069	1927	1971	1971	FB6411		79220	79282

WUC	SYSTEM SER NUMBER	CY	TEST DATE	TEST FDC	A	REPAIR DATE	REPAIR FCC	A	VEN	AL	REFCFT NUMBER	MAINT REC DATE	FOH	REC ETI	REP ETI	SHIP ETI	SRAN REC	SRAN SHIP	SRAN REC DATE	SRAN SHIP DATE
73FA0	AF00065	07	81315	ACK	C	81324	XCM	G	N	U	072390	81314	1643	3202	3254	3254	FB6352		81299	81324
73FA0	AF00066	02	74102	CPN	C	74112	CAN	G	N	V	449284	74092	0034	0368	0409	0409	FB4604	FB2039	74092	74112
73FA0	AF00066	03	81300	FCM	C	81304	FCM	A	N	A	070775	81296	2887	3296	3299	3299	999999		81296	81304
73FA0	AF00067	11	79153	ADQ	C	79170	ADQ	G		V	007654	79152	0110	1135	0161	0161	FB4808		79152	79170
73FA0	AF00067	12	81320	FEA	C	81365	FEA	F	N	V	074727	81317	0688	0845	0893	0893	FB6355		81314	81365
73FA0	AF00068	04	79319	799	B	79315	799	E		F	019956	79319	0135	2553	2595	2595	FB6563		79319	79319
73FA0	AF00071	07	78340	RBF	C	78363			N	U	002175	78335	0081	0883	0942	0942	FG6563		78335	78363
73FA0	AF00074	05	80162	CSZ	C	80175	CSZ	A	N	V	035862	80162	0512	1558	1605	1605	999999		80155	80176
73FA0	AF00074	06	80252	LEA	C	80276	LEA	F	N	V	039863	80247	0024	1629	1672	1672	FB6022		80238	80276
73FA0	AF00075	01	78031	799	B		799	E	N	F	643742	78018		0764	0801	0801			78018	78031
73FA0	AF00077	05	80010	CSZ	C	80035	FEA	F	N	V	022948	80003	0294	1578	1623	1623	FB6411		80002	80035
73FA0	AF00077	06	81311	CPZ	C	81334	HBD	F		V	072853	81309	0502	2125	2159	2159	FB6355		81309	81334
73FA0	AF00078	05	80038	799	B	80038	799	E	N	R	025265	80032	0067	0849	0891	0891	FB6354		80023	80038
73FA0	AF00078	06	81057	FEA	C	81071	HBA	F	N	U	051403	81054	0020	0911	0998	0998	FB6221		81048	81071
73FA0	AF00079	01	76360	246	K		799	E	N	R	585876	76324		0454	0507	0507	FB4806	FB4604	76324	76355
73FA0	AF00080	02	79227	C70	C	79290	FEA	F	N	V	012161	79226	0546	1481	1606	1606	FB6354		79212	79290
73FA0	AF00080	03	80079	799	D	80079	799	E		R	028507	80063	0095	1701	1736	1736	FB4810		80063	80079
73FA0	AF00080	04	81037	CSD	C	81037	CSD	A		V	050196	81036	0029	1765	1814	1814	FB6540		81036	81037
73FA0	AF00080	05	81111	GDG	C	81223	CCG	G	N	V	064783	81110	0003	1817	1882	1882	FB6563		81110	81223
73FA0	AF00081	01	81046	KBA	C	81084	KEA	F	N	V	050678	81044		2132	2174	2174	FB6022		81044	81084
73FA0	AF00081	02	81198	FCD	C	81198	FCC	A		V	062765	81189	0035	2209	2255	2255	FB6141		81189	81198
73FA0	AF00081	03	81344	WDO	C	81351	WDC	G		V	074339	81338	0004	2259	2298	2298	999999		81338	81351
73FA0	AF00082	07	79234	CSB	C	79334	FEA	F	N	V	012304	79232	0021	0870	0905	0905	FB6411		79220	79334
73FA0	AF00083	01	79295	799	B	79295	799	B	N	F	017667	79282		1081	1134	1134	FB6311		79282	79295
73FA0	AF00083	02	81014	CPN	C	81021	CSJ	A	N	V	048123	81014	0380	1514	1548	1548	FB6142		81014	81021
73FA0	AF00084	01	80149	C70	C	80169	HEA	F	N	U	032969	80053		0873	0930	0930	FB6221		80052	80169
73FA0	AF00084	02	81237	TGS	C	81244	TGS	A		V	066676	81236	0153	1083	1136	1136	FB6355		81236	81244
73FA0	AF00084	03	81342	ACK	C	81351	HSE	F		V	074338	81338	0005	1141	1173	1173	999999		81338	81351
73FA0	AF00085	02	80151	799	B	80151	799	E	N	R	033339	80130	0997	1256	1286	1286	FB6311		80122	80151
73FA0	AF00087	04	79214	CSZ	C	79226	CSZ	A	N	V	010660	79213	0237	1289	1356	1356	FB6354		79213	79226
73FA0	AF00087	05	81316	CDJ	C	81336	CDJ	G		V	072991	81314	0093	1449	1482	1482	FB6540		81314	81336
73FA0	AF00087	06							N			82068	0045	1527			FB6311		82062	
73FA0	AF00088	01	76261	NPC	C	76267	NPC	G	N	V	585562	76245		0163	0214	0214	FB4806	FB6381	76245	76268
74FA0	AF00089	01	79262	C70	C	80008	070	F	N	V	014277	79236		0814	0990	0990	FB6141		79226	80008
73FA0	AF00089	02	81010	800	C	81163	HEC	F		V	047743	81009	0180	1170	1248	1248	FB4805		81009	81168
73FA0	AF00089	03	81316	FBA	C	81343	WFN	F	N	V	073492	81316	0066	1314	1342	1342	FB6563		81303	81343
73FA0	AF00090	03	80247	C70	C	80274	GEA	F	N	V	039613	80247	0298	0907	1015	1015	FB6354		80233	80274
73FA0	AF00090	04	81034	799	B	81034	799	E	N	F	049719	81022	0039	1054	1089	1089	FB6141		81022	81034
73FA0	AF00090	05	81316	CPU	C	82028	CBC	F	N	V	077117	81316	0095	1184	1303	1303	FB6461		81302	82028
73FA0	AF00091	04	79234	C70	C	79249	070	G	N	N	013342	79232	1001	1460	1518	1518	FB6311		79232	79249
73FA0	AF00091	05	80035	TSP	C	80036	CD2	G	N	N	024814	80003	0124	1642	1679	1679	FB4809		79360	80036
73FA0	AF00091	06	81147	CFN	C	81181	TBF	F		V	061584	81118	0085	1764	1801	1801	999999		81118	81181
73FA0	AF00091	07	81254	CGZ	C	82060	CGZ	G		L	079164	81251	0003	1804	1901	1901	999999		81251	82060
73FA0	AF00092	04	80210	HBD	C	80226	HED	F	N	V	037828	80197	0422	1466	1535	1535	FB6563		80189	80226
73FA0	AF00093	01	81022	PGE	C	81027	PCE	G	N	V	048702	81021		1765	1807	1807	FB6540		81021	81027
73FA0	AF00094	01	80079	C70	C	80079	C70	G	N	N	028508	80053		1560	1623	1623	FB4805		80051	80079
73FA0	AF00094	02	80128	37F	C	80136	37F	F	N	V	031737	80109	0012	1635	1667	1667	FB4805		80105	80136
73FA0	AF00094	03	81302	ACK	C	81311	CSD	A	N	A	071334	81299	0055	1722	1789	1789	FB6354		81299	81311
73FA0	AF00096	01	79256	799	B	00000	000	0	N	R	013812	79247		0144	0192	0192	FB6141		79247	79256
73FA0	AF00096	02	80221	799	B	80221	799	B		F	038236	80214	0162	0354	0401	0401	FB2805		80214	80221

APPENDIX C

K051 LOGISTIC SUPPORT COST BREAKDOWN

Explanation. The appendix contains extracts from the K051 Logistic Support Cost Breakdown for the A-7D MDS and WUC 73FAO (first column). The cost data (presented in dollars) represent quarterly totals for the quarter indicated by the "as of" date in the top left corner of each page. The data for trouble-shooting costs were found by locating the WUC 73FAO in column 1, verified by the noun "Unit Inertial M" in column 2, and looking under the column labeled "Field Maint." Transportation costs were found in the same way under the column labeled "Pack-Ship Cost." The entries used are identified by an "X" in the left-hand margin of each page.

F111
WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 81 SEP

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-K031.-F11-LG-002
DATE PROCESSED

		QUARTERLY VALUES			
WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
73ECP	ASSY ANALOG OUT	$250	$672	$2	$0
73ECQ	ASSY ANALOG INP	$68	$552	$3	$0
73ECR	ASSY RATE-DEFL	$87	$240	$1	$0
73ECT	ASSY FUNCTION C	$48	$0	$0	$0
73ECU	ASSY CLOCK THEK	$201	$612	$3	$0
73ECO	NT ELECT EQUIPM	$803	$0	$0	$0
73ECA	ASSY FAN	$85	$0	$0	$0
73ECD	WIRING CONNS PI	$1,484	$0	$0	$0
73EXX		$132,213	$42,490	$1,459	$430
73FUD	INERTIAL MSURMN	$58,021	$0	$0	$0
73FAO	UNIT INERTIAL M	$103,367	P $239,694	$2,841	P $0
73FA?	NOC	$34	$0	$0	$0
73FAD	COARD CAFRI	$398	$13,499	$71	$0
73FAE	MODULE GIMBAL L	$172	$3,872	$11	$0
73FAF	MODULE PWR SUP	$315	$3,164	$9	$0
73FAG	MODULE MODE SWI	$268	$1,716	$3	$0
73FAJ	ACCLOROMETER X-Y	$12	$0	$0	$0
73FC?	RACK ELEC EQUIP	$1,356	$0	$0	$0
73FCU	CONTROLLER INS	$2,495	$178	$4	$0
73FC?	NOC	$70	$0	$0	$0
73FCA	ASSY MECHANICAL	$12	$0	$0	$0
73FCD	FRONT PANEL	$173	$0	$0	$0
73FLD	ADPTR PWR SP LS	$56,216	$30,670	$475	$0
73FD2	NOC	$526	$0	$0	$0
73FDB	CARD SEQUENCER	$433	$595	$5	$0
73FDC	CARD SEQUENCER	$114	$296	$3	$0
73FDD	MODULE 800 HZ	$106	$921	$2	$0
73FDE	MODULE HEAD REP	$3,972	$6,203	$102	$0
73FDF	MODULE RELAY DR	$5	$0	$0	$0
73FDG	CARD RELAY DRIV	$153	$500	$3	$0
73FDH	CARD RELAY DRIV	$261	$772	$4	$0
73FDJ	MODULE ROL-PITC	$673	$0	$0	$0
73FDK	DRIVER AMPLIFIE	$328	$0	$0	$0
73FDL	POWER SUPPLY	$155	$676	$15	$0
73F??	CARD PWR SUPPLY	$2,632	$1,166	$0	$0
73F??	CARD PWR SUPPLY	$1,330	$1,020	$10	$0
[illegible]	CARD PWR SUPPLY	[illegible]	[illegible]	[illegible]	[illegible]

WEAPON SYSTEM   A0170   OCALC
AFM 65-110/66-1 DATA AS OF 81 JUN

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-K051.-PN4-LO-MOZ
DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
		QUARTERLY VALUES			
730CB	DIGITAL CKT BD	$422	$193	$2	$0
730CC	FRONT PANEL	$12	$0	$0	$0
730EO	WAVEGUIDE EXTER	$19	$0	$0	$0
730FO	WIRING CONNS PI	$97	$0	$1	$0
730XX		$110,315	$36,600	$575	$293
73E00	DIS SYS HEADSUP	$13,236	$0	$0	$0
73EA0	DIS UNIT HEADSU	$93,388	$31,200	$1,374	$0
73EA3	ASSY CHASIS LVP	$211	$0	$0	$0
73EA9	NOC	$31	$0	$0	$0
73EAD	ASSY COMBINER	$150	$0	$0	$0
73EAD	ASSY CONTROL PA	$763	$2,080	$72	$0
73EAE	ASSY TUBE UNIT	$1,045	$3,093	$40	$152
73EAF	ASSY CATHODE RA	$111	$311	$3	$0
73EAK	ASSY CRT MATCHI	$26	$123	$1	$0
73EAM	PWR SUPLY HIGH	$101	$0	$0	$0
73EAG	AMPLIFER DEFLEC	$75	$230	$1	$0
73EAR	ASSY VIDEO	$63	$123	$1	$0
73EAS	ASSY BITE	$126	$192	$3	$0
73EAT	PWR SUPLY LOW V	$6,040	$226	$0	$0
73EAU	PRNT CIR BRD IN	$657	$1,303	$12	$0
73EAV	CIR BRD ER AMP/	$513	$1,597	$17	$0
73EAW	CIR BRD OUTPT R	$1,160	$1,615	$25	$0
73EAZ	ASSY RECTFIER D	$27	$74	$1	$0
[illegible]	[illegible]	$13,[illegible]	$3,039	$60	$0
73F00	INERTIAL MSURMN	$71,88	$410	$1	$0
X 73FA0	UNIT INERTIAL M	$91,920	$125,028	$1,527	$0
73FAD	BOARD CAPRI	$1,031	$10,181	$69	$0
73FAE	MODULE GIMBAL L	$472	$2,540	$7	$0
73FAF	MODULE PWR SUP	$107	$756	$3	$0

H11

WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 81 MAR

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-F051.-PN4-LQ-MAZ
DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73ECN	ASSY CORE PLANE	$140		$171		$1		$0
73ECP	ASSY ANALOG OUT	$73		$801		$2		$0
73ECQ	ASSY ANALOG INP	$36		$200		$1		$0
73ECR	ASSY RATE-DEFL	$70		$0		$0		$0
73ECT	ASSY FUNCTION C	$56		$226		$1		$0
73ECU	ASSY CLOCK CHEK	$138		$666		$3		$0
73ECV	ASSY PARAMETR C	$73		$270		$1		$0
73ECZ	PWR SUPPLY LOW	$90		$0		$0		$0
73EC0	DT ELECT EQUIPM	$163		$0		$0		$0
73ECA	ASSY FAN	$709		$0		$0		$0
73ED0	WIRING CONNS PI	$1,114		$0		$0		$0
73EXX		$124,502		$72,831		$2,697		$0
73FOO	INERTIAL MSURMN	$50,573		$0		$0		$0
X 73FAU	UNIT INERTIAL N	$95,520	P	$141,777		$1,951	P	$0
73FA9	MOC	$269		$0		$0		$0
73FAD	BOARD CAMAI	$1,016		$11,099		$9		$0
73FAE	MODULE GIMBAL L	$230		$8,232		$16		$0
73FAF	MODULE PWR SUP	$50		$1,424		$5		$0
73FAG	MODULE MODE SWI	$276	P	$2,961	P	$5	P	$0
73FCU	RACK ELEC EQUIP	$702		$0		$0		$0
73FC0	CONTROLLER INS	$1,995		$504		$9		$0
73FC9	MOC	$157		$0		$0		$0
73FCC	FRONT PANEL	$201		$0		$0		$0
73FD0	ADPTR PWR SP LS	$70,698		$10,969		$213		$0
73FD9	MOC	$51		$0		$0		$0
73FDB	CARD SEQUENCER	$342		$919		$6		$0
73FDC	CARD SEQUENCER	$620		$1,166		$7		$0
73FDD	MODULE 800 HZ	$113		$877		$2		$0
73FDE	MODULE HEAD REP	$2,597		$843		$16		$0
73FDF	MODULE RELAY DR	$24		$0		$0		$0
73FDG	CARD RELAY DRIV	$336		$535		$3		$0
73FDH	CARD RELAY DRIV	$77		$746		$2		$0
73FDJ	MODULE ROL-PITC	$409		$0		$0		$0
73FDK	DRIVER AMPLIFIE	$194		$0		$0		$0
73FDL	POWER SUPPLY	$41		$178		$7		$0
73FDM	CARD PWR SUPPLY	$473		$1,672		$16		$0
73FDN	CARD PWR SUPPLY	$424		$445		$7		$0

AUG
CARBON SYSTEM AUG/71 OCALC LOGISTIC SUPPORT COST RANKING
AFM 65-110/66-1 DATA AS OF 80 DEC WORK UNIT CODE STATUS
LOG-LO(Q)7953

WUC	NOUN	PERCENT SYSTEM	CAT IND	CURRENT QTR RANK	CURRENT QTR LSC	1ST PREV QTR RANK	1ST PREV QTR LSC	2ND PREV QTR RANK	2ND PREV QTR LSC	3RD PREV QTR RANK	3RD PREV QTR LSC	SPEC INV	SPE [illegible]
73EAV	SENSOR AUTO B		B					1586	$79				
73EAZ	ASSY RECTFIER	0.001	B	P1796	$47	P 926	$178	1538	$85	P 1023	[illegible]		
73EB0	SIGNAL DATA P	0.187	B	95	$6077	54	$8995	57	$11532	42	[illegible]		
73EB1	CIRCUIT BOARD		B					1650	$68	1546	[illegible]		
73EB9	NOC	0.000	C	2258	$9			1970	$32	1723	$34		
73EBA	ASSY DATA INP	0.005	B	P1121	$174	1250	$90	1412	$108	1143	$113		
73EBB	ASSY ADDER/ME	0.000	B	2370	$4	1720	$32	P 2204	$16	2374	$3		
73EBC	ASSY PROCESOR	0.001	B	2071	$20	1185	$104	1544	$84	1114	$119		
73EBE	ASSY DISCRETE	0.003	B	1425	$98	1542	$49	1791	$49				
73EBH	ASSY INSTRCTI	0.000	B	2298	$8	1909	$16	2459	$4				
73EBJ	ASSY STR CONT	0.000	B	2392	$4	P 1751	$28	P 1065	$43	P 1528	$54		
73EBK	ASSY DRIVR TR	0.001	B	1825	$44	1466	$60	1505	$90	2293	$5		
73EBL	ASSY STORE CO		B			1160	$108	1063	$220				
73EBM	ASSY CORE PLA	0.000	B	2248	$10	602	$379						
73EBP	ASSY ANALOG O	0.010	B	842	$312	433	$649	567	$624	1092	$126		
73EBQ	ASSY ANALOG I	0.005	B	1196	$151	1633	$40	1474	$96	1925	$22		
73EBR	ASSY RATE-DEF	0.004	B	1238	$139	962	$162	2127	$20	759	$248		
73EBS	ASSY OVERFLOW		B			2129	$8	1704	$63	1460	$60		
73EBT	ASSY FUNCTION	0.003	B	1513	$84	P 1507	$53	2094	$23	2371	$3		
73EBU	ASSY CLOCK CH	0.004	B	1275	$129	1376	$71	962	$266	827	$211		
73EBV	ASSY PARAMETR	0.001	B	1777	$40	1656	$36	2115	$20	2336	35		
73EBZ	PWR SUPPLY LO	0.002	B	1663	$61			1980	$32	1910	$22		
73EC0	MT ELECT EQUI	0.001	B	1870	$39	1565	$47	2403	$6	952	$161		
73EC9	NOC					1586	$44						
73ECA	ASSY FAN	0.005	B	1198	$150			2182	$16	964	$159		
73ED0	WIRING CONNS	0.005	C	1096	$179	654	$316	1100	$199	1010	$146		
73EXX					$74129		$94749		$93265		$81115		
73FA0	INERTIAL MSUR	0.627	B	26	$20408	35	$16493	23	$28191	21	$16448		
73FAD	UNIT INERTIAL	3.135	B	P 2	$102098	2	$128075	2	$136340	2	$112170		
73FA9	NOC	0.000	C	2291	$8	2198	$4	1748	$56				
73FAD	BOARD CAPRI	0.148	B	119	$4833	454	$595	654	$504	86	$4880		
73FAE	MODULE GIMBAL	0.058	B	242	$1078	313	$1095	302	$1522	150	$2276		
73FAF	MODULE PWR SU	0.016	B	P 617	$505	304	$1133	620	$541	279	$1160		
73FAG	MODULE MODE S	0.024	B	467	$771	444	$612	467	$852	243	$1358		
73FAQ	GYROSCPE Z AX		B							2298	35		
73FAT	GMELE TMP CON	0.000		2193	$14								
73FAV	CLSTR CONT TM		B							1279	$87		
73FB0	RACK ELEC EQU	0.013	B	685	$426	234	$1623	733	$424	789	$230		

NO	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
73E..	DIS UNIT HEADSU	$90,075	$118,032	$4,397	$0
73E..	NOC	$31	$0	$0	$0
73EAA	MODULE OPTICAL	$61	$0	$0	$0
73EAB	ASSY COMBINER	$19	$0	$0	$0
73EAD	ASSY CONTROL PA	$274	$0	$0	$0
73EAE	ASSY TUBE UNIT	$521	$3,792	$24	$0
73EAF	ASSY CATHODE RA	$109	$1,264	$8	$0
73EAP	ASSY CRT MATCHI	$17	$115 P	$0	$0
73EAM	PWR SUPLY HIGH	$782	$1,080	$20	$5,500
73EAQ	AMPLIFER DEFLEC	$516	$424	$3	$0
73EAR	ASSY VIDEO	$232	$555	$2	$0
73EA.	ASSY BITE	$308	$562	$6	$0
73EAT	PWR SUPLY LOW V	$7,429	$0	$0	$0
73EAU	PRNT CIR BRD IN	$988	$1,471	$14	$0
73EAV	CIR BRD CR AMP/	$373	$1,086	$4	$0
73EAW	CIR BRD OUTPT R	$760	$1,200	$16	$0
73EAX	ASSY ELECTRONIC	$63	$0	$0	$0
73EAZ	ASSY RECTFIER B	$281	$252 P	$0	$0
73EB0	SIGNAL DATA PRO	$21,989	$4,902	$95	$0
73EBA	ASSY DATA INPUT	$128	$140	$1	$0
73EBB	ASSY ADDER/MEMO	$97	$0	$0	$0
73EBC	ASSY PROCESOR C	$109	$202	$2	$0
73EBE	ASSY DISCRETE I	$24	$121	$1	$0
73EBH	ASSY INSTRCTION	$48	$0	$0	$0
73EBJ	ASSY STR CONT R	$84 P	$0 P	$0	$0
73...		$135,511	$137,876	$4,601	$5,262
73F..	INERTIA MEASMN	$42,480	$0	$0	$0
73FAD	UNIT INERTIAL M	$124,926	$256,431	$2,868	$0
73FA9	NOC	$12	$0	$0	$0
73FAD	BOARD CAPPI	$302	$1,482	$1	$0

K11
WEAPON SYSTEM 4007D OCALC
AFM 65-110/66-1 DATA AS OF 30 JUN

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-F051,-PN4-LQ-M
DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
		QUARTERLY VALUES			
73EDH	ASSY INSTRCTION	$12	$0	$0	$0
73EDJ	ASSY STR CONT R	$128	P $0	P $0	$0
73EDK	ASSY DRIVR TRAN	$82	$181	$1	$0
73EDL	ASSY STORE CONT	$72	$586	$1	$0
73EDP	ASSY ANALOG OUT	$104	$1,764	$5	$0
73EDQ	ASSY ANALOG INP	$36	$252	$1	$0
73EBR	ASSY RATE-DEFL	$61	$0	$0	$0
73EBS	ASSY OVERFLOW R	$41	$146	$1	$0
73EBT	ASSY FUNCTION C	$68	$0	$0	$0
73EBU	ASSY CLOCK CHEK	$436	$360	$1	$0
73EBV	ASSY PARAMETR C	$61	$0	$0	$0
73EBZ	PWR SUPPLY LOW	$97	$0	$0	$0
73ECU	MT ELECT EQUIPM	$17	$0	$0	$0
73ECA	ASSY FAN	$48	$0	$0	$0
73EDO	WIRING CONNS PI	$596	$0	$0	$0
73EXX		$148,829	$127,349	$3,608	$8
73F00	INERTIAL MSURMN	$84,573	$0	$0	$0
73FA0	UNIT INERTIAL M	$132,477	$273,409	$3,134	$0
73FA9	NOC	$169	$0	$0	$0
73FAD	BOARD CAPRI	$624	$888	$1	$0
73FAE	MODULE GIMBAL L	$293	$4,263	$9	$0
73FAF	MODULE PWR SUP	$279	$1,340	$5	$0
73FAG	MODULE MODE SWI	$291	$2,259	$6	$0
73FB0	RACK ELEC EQUIP	$1,273	$0	$0	$0
73FC0	CONTROLLER IMS	$3,171	$1,630	$20	$0
73FCB	FRONT PANEL	$424	$0	$0	$0
73FD0	ADPTR PWR SP LS	$92,867	$28,477	$491	$0
73FD9	NOC	$259	$0	$0	$0
73FDA	MODULE SEQUENCE	$12	$233	$1	$0
73FDB	CARD SEQUENCER	$257	$749	$5	$0
73FDC	CARD SEQUENCER	$505	$913	$6	$0
73FDD	MODULE 800 HZ	$77	$240	$2	$0
73FDE	MODULE HEAD REP	$8,364	$6,462	$26	$1,336
73FDF	MODULE RELAY CR	$43	$359	$5	$0
73FDG	CARD RELAY DRIV	$406	$1,070	$6	$0
73FDH	CARD RELAY DRIV	$421	$1,573	$4	$0
73FDK	DRIVER AMPLIFIE	$90	$0	$0	$0

D11
WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 80 MAR

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-K051.-P//1-LQ-MQZ
DATE PROCESSED

		QUARTERLY VALUES			
WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
73EBP	ASSY ANALOG OUT	$122	$256	$1	$0
73EBQ	ASSY ANALOG INP	$66	$0	$0	$0
73EBR	ASSY RATE-DEFL	$99	$642	$2	$0
73EBS	ASSY OVERFLOW R	$32	$146	$1	$0
73EBT	ASSY FUNCTION C	$8	$0	$0	$0
73EBU	ASSY CLOCK CHEK	$131	$499	$3	$0
73EBV	ASSY PARAMETR C	$16	$0	$0	$0
73EBZ	PWR SUPPLY LOW	$66	$0	$0	$0
73EC0	MT ELECT EQUIPM	$483	$0	$0	$0
73ECA	ASSY FAN	$476	$0	$0	$0
73ED0	WIRING CONNS PI	$438	$0	$0	$0
73EXX		$106,822	$130,776	$5,071	$674
73F00	INERTIAL MSURMN	$44,749	$4,660	$36	$0
73FA0	UNIT INERTIAL M	$85,000	$245,980	$4,531	$0
73FAD	BOARD CAPRI	$368	$14,175	$98	$0
73FAE	MODULE GIMBAL L	$128	$6,604	$95	$0
73FAF	MODULE PWR SUP	$144	$3,324	$13	$0
73FAG	MODULE MODE SHI	$146	$3,915	$12	$0
73FA9	GYROSCPE Z AXIS	$16	$0	$0	$0
73FAV	CLSTR CONT TMPT	$16	$243	$1	$0
73FB0	RACK ELEC EQUIP	$690	$0	$0	$0
73FC0	CONTROLLER IMS	$2,205	$1,595	$32	$0
73FC9	NOC	$30	$0	$0	$0
73FD0	ADPTR PWR SP LS	$50,101	$35,090	$790	$0
73FD9	NOC	$250	$0	$0	$0
73FDB	CARD SEQUENCER	$102	$505	$5	$0
73FDC	CARD SEQUENCER	$128	$2,242	$47	$0
73FDD	MODULE 800 HZ	$77	$240	$3	$0
73FDE	MODULE HEAD REP	$3,604	$5,967	$111	$0
73FDG	CARD RELAY DRIV	$139	$672	$6	$0
73FDH	CARD RELAY DRIV	$23	$426	$2	$0
73FDJ	MODULE ROL-PITC	$113	$0	$0	$0
73FDK	DRIVER AMPLIFIE	$61	$0	$0	$0
73FDM	CARD PWR SUPPLY	$115	$839	$18	$0
73FDN	CARD PWR SUPPLY	$54	$605	$11	$0
73FD9	CARD PWR SUPPLY	$859	$924	$19	$0
73FC3	CARD PWR SUPPLY	$25	$238	$4	$0

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WEAPON SYSTEM A007D OCALC
AFM 66-110/66-1 DATA AS OF 79 DEC

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN
LOG-LO(Q)7953

Q-K051.-PN4-LQ-KQZ
DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73EAV	CIR BRD ER AMP/	$384		$2,033		$9		$41
73EAH	CIR BRD OUTPT R	$580		$1,372		$17		$100
73EB0	SIGNAL DATA PRO	$17,087		$6,975		$182		$0
73EB9	NOC	$33		$0		$0		$0
73EBA	ASSY DATA INPUT	$21		$296		$2		$0
73EBB	ASSY ADDER/MEMO	$172		$0		$0		$0
73EBC	ASSY PROCESOR C	$16		$202		$3		$0
73EBE	ASSY DISCRETE I	$16		$121		$2		$0
73EBH	ASSY INSTRCTION	$181		$525		$3		$0
73EBJ	ASSY STR CONT R	$82	P	$0	P	$0		$0
73EBL	ASSY STORE CONT	$16		$568		$2		$0
73EBP	ASSY ANALOG OUT	[illegible]		$946		$5		$0
73EBQ	ASSY ANALOG INP	$92		$804		$3		$0
73EBR	ASSY RATE-DEFL	$13		$324		$1		$0
73EBS	ASSY OVERFLOW R	$41		$0		$0		$0
73EBT	ASSY FUNCTION C	$33		$134		$1		$0
73EBU	ASSY CLOCK CHEK	$114		$684	P	$2		$0
73EBV	ASSY PARAMETR C	$8		$135		$1		$0
73EC0	MT ELECT EQUIPM	$866		$0		$0		$0
73ECA	ASSY FAN	$57		$0		$0		$0
73ED0	WIRING CONNS PI	$565		$0		$0		$0
73EXX		$109,909		$172,860		$6,785		$1,264
73F00	INERTIAL MSURMN	$53,750	P	$2,213		$44	P	$0
73FA0	UNIT INERTIAL M	$65,264	P	$154,714	P	$2,822	P	$0
73FAD	BOARD CAPRI	$382		$6,398		$88		$0
73FAE	MODULE GIMBAL L	$238		$2,004		$9		$0
73FAF	MODULE PWR SUP	$662		$4,560		$17		$0
73FAG	MODULE MODE SWI	$431		$2,325		$7		$0
73FAQ	GYROSCPE 2 AXIS	$230		$0		$0		$0
73FAU	AUX TMP CONT AM	$13		$0		$0		$0
73FAV	CLSTR CONT TMPT	$16		$0		$0		$0
73FB0	RACK ELEC EQUIP	$701		$0		$0		$0
73FC0	CONTROLLER IMS	$1,123		$331		$6		$0
73FCA	FRONT PANEL	$453		$0		$0		$0
73FD0	ADPTR PWR SP LS	$61,505		$27,287		$541		$0
73.D9	NOC	$41		$0		$0		$0
7?FDB	CARD SEQUENCER	$110		$550		$5		$0

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WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 79 SEP

LOGISTIC SUPPORT COST RANKING
LSC BREAKDOWN

Q-K051.-PN4-LG-M02
DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73EAS	ASSY BITE	$369		$4,157		$158		$0
73EAT	PWR SUPLY LOW V	$4,016		$1,120		$15		$28
73EAU	PRNT CIR BRD IN	$317		$842		$12		$114
73EAV	CIR BRD ER AMP/	$305		$1,438		$7		$44
73EAW	CIR BRD OUTPT R	$190		$980		$11		$142
73EAY	SENSOR AUTO BRI	$66		$0		$0		$0
73EB0	SIGNAL DATA PRO	$24,680		$5,648		$145		$0
73EB1	CIRCUIT BOARD R	$107	P	$146	P	$1	P	$0
73EB4	ASSY RECTFIER B	$8		$0		$0		$0
73EBA	ASSY DATA INPUT	$45	P	$151	P	$1		$0
73EBB	ASSY ADDER/MEMO	$126	P	$596	P	$2		$0
73EBC	ASSY PROCESOR C	$54		$404		$6		$0
73EBE	ASSY DISCRETE I	$16		$122		$2		$0
73EBH	ASSY INSTRCTION	$61		$652		$4		$0
73EBJ	ASSY STR CONT R	$172	P	$127	P	$1		$0
73EBK	ASSY DRIVR TRAN	$60		$784		$4		$0
73EBL	ASSY STORE CONT	$54		$858		$3		$0
73EBM	ASSY CORE PLANE	$24		$117		$1		$517
73EBP	ASSY ANALOG OUT	$414		$2,556		$10		$0
73EBQ	ASSY ANALOG INP	$163		$765		$3		$0
73EBR	ASSY RATE-DEFL	$567		$2,716	P	$4		$0
73EBS	ASSY OVERFLOW R	$76		$469		$3		$0
73EBT	ASSY FUNCTION C	$71		$134		$1		$0
73EBU	ASSY CLOCK CHEK	$26		$518		$3		$0
73EBV	ASSY PARAMETR C	$24		$0		$0		$0
73EC0	MT ELECT EQUIPM	$711		$0		$0		$0
73ECA	ASSY FAN	$117		$0		$0		$0
73ECG	WIRING CONNS FI	$325		$2,157		$44		$0
73EYY		$116,180		$175,019		$6,110		$889
73FCC	INERTIAL MSURMN	$63,632	P	$2,157		$44	P	$0
X 73FA0	UNIT INERTIAL M	$97,117		$286,560		$5,129		$0
73FA9	NOC	$56		$0		$0		$0
73FAD	BOARD CAPRI	$287		$5,355		$5		$0
73FAE	MODULE GIMBAL L	$425		$6,966		$29		$0
73FAF	MODULE PWR SUP	$238		$3,432		$13		$0
73FAG	MODULE MODE SWI	$169		$2,574		$7		$0
73FAN	ACCLMTER Z AXIS	$41		$0		$0		$0

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WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 79 JUN

LOGISTIC SUPPORT COST RANKING
CURRENT QUARTER COMPUTATION

Q-K051.-PN4-LQ-MQ2
DATE PROCESSED

WUC	NOUN	QUARTERLY VALUES FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
73EBC	ASSY PROCESOR C	$8	$208	$3	$0
73EBE	ASSY DISCRETE I	$10	$93	$2	$122
73EBH	ASSY INSTRCTION	$94	$360	$2	$0
73EBJ	ASSY STR COM R	$304	P $128	P $1	$0
73EBK	ASSY DRIVR TRAN	$115	$921	$4	$0
73EBL	ASSY STORE CONT	$181	$873	$3	$0
73EBM	ASSY CORE PLANE	$149	$329	$3	$1,714
73EBP	ASSY ANALOG OUT	$312	P $2,166	P $7	P $0
73EBQ	ASSY ANALOG INP	$140	$528	$2	$0
73EBR	ASSY RATE-DEFL	$25	$666	$2	$0
73EBT	ASSY FUNCTION C	$49	$0	$0	$0
73EBU	ASSY CLOCK CHEK	$115	$378	$2	$0
73EBX	PWR SUPLY 5 VOL	$112	$0	$0	$0
73EBZ	PWR SUPPLY LOW	$8	$242	$5	$0
73ECD	MT ELECT EQUIPM	$1,450	$0	$0	$0
73ECA	ASSY FAN	$230	$0	$0	$0
73EDD	WIRING CONNS PI	$1,832	$0	$0	$0
73EXX		$110,283	$120,190	$3,976	$2,337
73F00	INERTIAL MSURMN	$58,631	$0	$0	$0
X 73FA0	UNIT INERTIAL M	$69,190	$184,295	$3,505	$0
73FA9	NOC	$54	$0	$0	$0
73FAD	BOARD CAPRI	$125	$1,750	$2	$0
73FAE	MODULE GIMBAL L	$218	$2,113	$10	$0
73FAF	MODULE PWP SUP	$72	$996	$6	$0
73FAG	MODULE MODE SWI	$74	$1,492	$4	$0
73FB0	RACK ELEC EQUIP	$796	$0	$0	$0
73FC0	CONTROLLER IMS	$2,639	$814	$13	$0
73FC9	NOC	$148	$0	$0	$0
73FCB	FRONT PANEL	$110	$0	$0	$0
73FD0	ADPTR PWR SP LS	$47,579	$11,024	$351	$0
73FD9	NOC	$450	$0	$0	$0
73FDB	CARD SEQUENCER	$274	$417	$3	$0
73FDC	CARD SEQUENCER	$413	$904	$6	$0
73FDD	MODULE 800 HZ	$523	$530	$8	$0
73FDE	MODULE HEAD REP	$4,665	$6,987	$145	$0
73FDG	CARD RELAY DRIV	$59	$372	$3	$0
73FDH	CARD RELAY DRIV	$50	$150	$1	$0
73F[illegible]	POWER SUPPLY	$82	$0	$0	$0

C11
WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 78 DEC

LOGISTIC SUPPORT COST RANKING
CURRENT QUARTER COMPUTATION

K051.PN4M
DATE PROCESSED

WUC	NOUN	QUARTERLY VALUES FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
73EBL	ASSY STORE CONT	$85	$1,460	$5	$0
73EBM	ASSY CORE PLANE	$56	$548	$5	$2,720
73EBP	ASSY ANALOG OUT	$280	$2,504	$9	$0
73EBQ	ASSY ANALOG INP	$315 P	$1,064 P	$4 P	$0
73EBR	ASSY RATE-DEFL	$300	$1,998	$6	$0
73EBS	ASSY OVERFLOW R	$57	$304	$2	$0
73EBT	ASSY FUNCTION C	$57	$129	$1	$0
73EBU	ASSY CLOCK CHEK	$93	$1,330	$7	$0
73EBX	PWR SUPLY 5 VOL	$49	$398	$11	$0
73EBZ	PWR SUPPLY LOW	$66	$244	$5	$0
73EC0	MT ELECT EQUIPM	$1,162	$0	$0	$0
73ECA	ASSY FAN	$138	$0	$0	$0
73ED0	WIRING CONNS PI	$120	$0	$0	$0
73EXX		$137,712	$210,294	$5,725	$16,019
73F00	INERTIAL MSURMN	$52,836	$0	$0	$0
73FA0	UNIT INERTIAL M	$94,732	$206,724	$3,932	$0
73FA9	NOC	$355	$0	$0	$0
73FAD	BOARD CAPRI	$134	$4,542	$6	$0
73FAE	MODULE GIMBAL L	$216	$3,598	$21	$0
73FAF	MODULE PWR SUP	$139	$3,327	$21	$0
73FAG	MODULE MODE SWI	$121	$1,605	$5	$0
73FAP	GYROSCPE X-Y AX	$36	$0	$0	$0
73FB0	RACK ELEC EQUIP	$889 P	$1,047	$44 P	$0
73FC0	CONTROLLER IMS	$2,604	$2,802	$38	$0
73FC9	NOC	$5	$0	$0	$0
73FCB	FRONT PANEL	$131	$0	$0	$0
73FD0	ADPTR PWR SP LS	$58,723	$8,456	$352	$0
73FD9	NOC	$273	$0	$0	$0
73FDB	CARD SEQUENCER	$115	$1,088	$9	$0
73FDC	CARD SEQUENCER	$122	$1,078	$7	$0
73FDD	MODULE 800 HZ	$118	$395	$4	$0
73FDE	MODULE HEAD REP	$4,627	$9,828	$180	$0
73FDG	CARD RELAY DRIV	$146	$1,103	$12	$0
73FDH	CARD RELAY DRIV	$99	$830	$5	$0
73FDK	DRIVER AMPLIFIE	$24	$468	$9 P	$0
73FDM	CARD PWR SUPPLY	$133	$4,836	$38	$0
73FDN	CARD PWR SUPPLY	$13	$95	$2	$0
73FDP	CARD PWR SUPPLY	$31	$270	$9	$0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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WEAPON SYSTEM   A007D   OCALC
AFM 65-110/66-1 DATA AS OF 78 SEP

LOGISTIC SUPPORT COST RANKING
CURRENT QUARTER COMPUTATION

K051.PN4M
DATE PROCESSEI

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
73EBU	ASSY CLOCK CHEK	$1,503	P	$1,779	P	$9	P	$14
73EBV	ASSY PARAMETR C	$24		$146		$1		$0
73EBX	PWR SUPLY 5 VOL	$107		$0		$0		$0
73EBZ	PWR SUPPLY LOW	$16		$0		$0		$0
73EC0	MT ELECT EQUIPM	$1,184		$0		$0		$0
73ECA	ASSY FAN	$373		$0		$0		$0
73ED0	WIRING CONNS PI	$670		$0		$0		$0
73EXX		$146,171		$141,953		$4,635		$6,704
73F00	INERTIAL MSURMN	$61,925		$4,455		$86		$0
X 73FA0	UNIT INERTIAL M	$98,908		$280,665		$5,386		$0
73FA9	NOC	$57		$0		$0		$0
73FAD	BOARD CAPRI	$306		$3,414		$5		$0
73FAE	MODULE GIMBAL L	$178		$1,872		$13		$0
73FAF	MODULE PWR SUP	$85		$2,562		$15		$0
73FAG	MODULE MODE SWI	$118		$1,360		$5		$0
73FB0	RACK ELEC EQUIP	$864		$0		$0		$0
73FC0	CONTROLLER IMS	$2,736		$1,386		$19		$0
73FC9	NOC	$123		$0		$0		$0
73FCB	FRONT PANEL	$159		$0		$0		$0
73FD0	ADPTR PWR SP LS	$63,985		$19,726		$665		$0
73FD9	NOC	$488		$144		$3		$0
73FDB	CARD SEQUENCER	$152		$810		$6		$0
73FDC	CARD SEQUENCER	$273	P	$2,090		$20	P	$0
73FDD	MODULE 800 HZ	$127		$2,099		$53		$0
73FDE	MODULE HEAD REP	$4,598	P	$10,715		$198	P	$0
73FDF	MODULE RELAY DR	$16	P	$460		$9	P	$0
73FDG	CARD RELAY DRIV	$196		$1,322		$14		$0
73FDH	CARD RELAY DRIV	$170		$1,835		$13		$0
73FDJ	MODULE ROL-PITC	$381		$0		$0		$0
73FDK	DRIVER AMPLIFIE	$105		$0		$0		$0
73FDM	CARD PWR SUPPLY	$282		$2,016		$45		$0
73FDN	CARD PWR SUPPLY	$57		$312		$6		$0
73FDP	CARD PWR SUPPLY	$65		$222		$9		$0
73FDQ	CARD PWR SUPPLY	$250		$2,576		$45		$0
73FDR	CARD PWR SUPPLY	$29		$95		$2		$0
73FDT	MOTHER BOARD CL	$16		$65		$1		$0
73FDU	MOTHER BOARD MO	$115		$144		$3		$0
73FE0	MOUNT ADPT/PS	$209		$0		$0		$0
73FF0	BATTERY PACK IM	$255		$0		$0		$0

D 11
WEAPON SYSTEM A007D OCALC
AFM 65-110/66-1 DATA AS OF 78 JUN

LOGISTIC SUPPORT COST RANKING
CURRENT QUARTER COMPUTATION

K051.PN4M
DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
		QUARTERLY VALUES			
73ED0	WIRING CONNS PI	$245	$0	$0	$0
73EXX		$86,843	$115,230	$2,625	$4,407
73F00	INERTIAL MSURMN	$54,783	$0	$0	$0
X 73FA0	UNIT INERTIAL M	$72,248	$271,526	$3,096	$0
73FAD	BOARD CAPRI	$235	$6,567	$9	$0
73FAE	MODULE GIMBAL L	$175	$2,065	$11	$0
73FAF	MODULE PWR SUP	$258	$2,659	$13	$0
73FAG	MODULE MODE SWI	$18	$222	$1	$0
73FAK	PLENUM	$21	$177	$2	$0
73FAR	ACCLMTR ELECTRN	$14	$0	$0	$0
73FAT	GMBLE TMP CONT	$18	$0	$0	$0
73FB0	RACK ELEC EQUIP	$923	$0	$0	$0
73FC0	CONTROLLER IMS	$1,786	$796	$10	$0
73FC9	NOC	$14	$0	$0	$0
73FCD	FRONT PANEL	$56	$0	$0	$0
73FD0	ADPTR PWR SP LS	$41,742	P $14,928	P $396	P $0
73FD9	NOC	$179	$0	$0	$0
73FDA	MODULE SEQUENCE	$63	$0	$0	$0
73FDB	CARD SEQUENCER	$119	$798	$5	$0
73FDC	CARD SEQUENCER	$111	$1,032	$5	$0
73FDD	MODULE 800 HZ	$174	$432	$4	$0
73FDE	MODULE HEAD REP	$1,297	$5,746	$84	$0
73FDF	MODULE RELAY DR	$108	$0	$0	$0
73FDG	CARD RELAY DRIV	$329	$1,573	$10	$0
73FDH	CARD RELAY DRIV	$81	$865	$4	$0
73FDL	POWER SUPPLY	$29	$204	$8	$0
73FDM	CARD PWR SUPPLY	$102	$1,099	$17	$0
73FDN	CARD PWR SUPPLY	$27	$333	$5	$0
73FDP	CARD PWR SUPPLY	$28	$137	$3	$0
73FDQ	CARD PWR SUPPLY	$111	$1,261	$16	$0
73FDR	CARD PWR SUPPLY	$14	$97	$2	$0
73FDS	MODULE BITE	$25	$240	$2	$0
73FDU	MOTHER BOARD HO	$28	$0	$0	$0
73FE0	MOUNT ADPT/PS	$67	$0	$0	$0
73FF0	BATTERY PACK IM	$126	$0	$0	$0
73FG0	XMTR REMOTE COM	$2,335	$286	$8	$0
73FH0	WIRING CONNS PI	$3,907	$0	$0	$0

D 11
WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) K051.PN4L
AFM 65-110/66-1 DATA AS OF 78 MAR CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST	CONSUMPTION
73EAW	CIR BRD OUTPT R	$337		$2,777		$20	$0
73EAY	SENSOR AUTO BRI	$14		$0		$0	$0
73EB0	SIGNAL DATA PRO	$24,238		$16,293		$164	$3,055
73EB1	CIRCUIT BOARD R	$7		$0		$0	$0
73EB9	NOC	$189		$0		$0	$0
73EBA	ASSY DATA INPUT	$112		$137		$1	$0
73EBB	ASSY ADDER/MEMO	$62	P	$146	P	$1	$0
73EBC	ASSY PROCESOR C	$84		$304		$5	$0
73EBH	ASSY INSTRCTION	$175		$342		$2	$0
73EBJ	ASSY STR CONT R	$197	P	$133	P	$1	$0
73EBK	ASSY DRIVR TRAN	$221		$170		$1	$0
73EBL	ASSY STORE CONT	$68		$508		$2	$0
73EBM	ASSY CORE PLANE	$200		$503		$4	[illegible]
73EBP	ASSY ANALOG OUT	$448		$6,256		$17	$604
73EBQ	ASSY ANALOG INP	$237		$3,020		$8	$0
73EBR	ASSY RATE-DEFL	$112		$900		$2	$0
73EBS	ASSY OVERFLOW R	$68		$330		[illegible]	$0
73EBT	ASSY FUNCTION C	$14		$117		$1	$0
73EBU	ASSY CLOCK CHEK	$238		$342		$2	$0
73EBV	ASSY PARAMETR C	$28		$101		$1	$0
73EBX	PWR SUPLY 5 VOL	$70		$895		$20	$0
73EBY	ASSY TRANSF/HEA	$7		$179		$4	$0
73EBZ	PWR SUPPLY LOW	$158		$660		$12	$0
73EC0	MT ELECT EQUIPM	$587		$0		$0	$0
73EC9	NOC	$35		$0		$0	$0
73ECA	ASSY FAN	$81		$0		$0	$0
73ED0	WIRING CONNS PI	$942		$0		$0	$0
73EXX		$101,048		$161,401		$4,655	$5,402
73F00	INERTIAL MSURMN	$45,990		$0		$0	$0
73FA0	UNIT INERTIAL M	$69,022		$220,202		$2,961	$0
73FA9	NOC	$161		$0		$0	$0
73FAD	BOARD CAPRI	$339		$8,357		$69	$0
73FAE	MODULE GIMBAL L	$112		$2,184		$13	$0
73FAF	MODULE PWR SUP	$128		$3,064		$13	$0
73FAG	MODULE MODE SWI	$154		$936		$3	$0
73FB0	RACK ELEC EQUIP	$1,845		$0		$0	$0
73FC0	CONTROLLER IMS	$1,388		$457		$5	$0
73FC9	NOC	$24		$0		$0	$0

B 11
WEAPON SYSTEM   A007D   OCALC   LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3)   K051.PH4L
AFM 65-110/66-1 DATA AS OF 77 DEC.   CURRENT QUARTER COMPUTATION   DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST
		QUARTERLY VALUES			
73EBS	ASSY OVERFLOW R	$4	$0	$0	$0
73EBU	ASSY CLOCK CHEK	$125	P $1,072	P $5	$0
73EBV	ASSY PARAMETR C	$56	$0	$0	$0
73EBX	PWR SUPLY 5 VOL	$7	$179	$4	$0
73ECO	MT ELECT EQUIPM	$564	$0	$0	$0
73ECA	ASSY FAN	$151	$0	$0	$0
73EDO	WIRING CONNS PI	$56	$0	$0	$0
73EXX		$91,540	$160,598	$4,619	$[illegible]
73FOO	INERTIAL MSURMN	$43,813	$0	$0	$0
X 73FAU	UNIT INERTIAL M	$63,424	$166,811	$2,546	$0
73FA9	NOC	$81	$0	$0	$0
73FAD	BOARD CAPRI	$196	$3,000	$4	$0
73FAE	MODULE GIMBAL L	$322	$3,710	$23	$0
73FAF	MODULE PWR SUP	$210	$3,258	$14	$0
73FAG	MODULE MODE SWI	$165	$2,952	$10	$0
73FAS	GYROSCPE ELECTR	$1,085	$0	$0	$0
73FBO	RACK ELEC EQUIP	$1,179	$0	$0	$0
73FCO	CONTROLLER IMS	$2,043	$1,308	$14	$0
73FCB	FRONT PANEL	$78	$0	$0	$0
73FDO	ADPTR PWR SP LS	$38,209	$10,619	$231	$0
73FD9	NOC	$116	$0	$0	$0
73FDB	CARD SEQUENCER	$178	$1,904	$11	$0
73FDC	CARD SEQUENCER	$167	$1,008	$9	$0
73FDD	MODULE 800 HZ	$67	$428	$4	$0
73FDE	MODULE HEAD REP	$2,366	$6,783	$109	$0
73FDF	MODULE RELAY DR	$14	$362	$2	$0
73FDG	CARD RELAY DRIV	$354	$1,988	$11	$0
73FDH	CARD RELAY DRIV	$67	$950	$4	$0
73FDL	POWER SUPPLY	$14	$102	$4	$0
73FDM	CARD PWR SUPPLY	$87	$1,971	$22	$0
73FDN	CARD PWR SUPPLY	$46	$438	$5	$1
73FDP	CARD PWR SUPPLY	$35	$456	$1[illegible]	$0
73FDQ	CARD PWR SUPPLY	$158	$3,812	$55	$1
73FDR	CARD PWR SUPPLY	$81	$887	$9	$0
73FDS	MODULE EITE	$7	$123	$1	$0
73FDT	MOTHER BOARD CL	$62	$454	$32	$0
73F[illegible]	MOTHER BOARD HO	$7	P $80	P $0	P $0
73FG[illegible]	XMTR REMOTE COM	$806	$444	$12	$1
[illegible]	[illegible] CONNS PI	$3,63[illegible]	$0	$1	$0

C 11
WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) K051.PN4L
AFM 65-110/66-1 DATA AS OF 77 SEP CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	QUARTERLY VALUES: FIELD MAINT		QUARTERLY VALUES: SPEC REPAIR COST		QUARTERLY VALUES: PACK-SHIP COST		QUARTERLY VALUES: CONDEMNATION COST
73EAN	MODULE HIGH VOL	$182		$1,862		$8		$0
73EAP	PRINTED WIRE BD	$25		$794		$2		$0
73EAQ	AMPLIFER DEFLEC	$98		$1,640		$8		$0
73EAR	ASSY VIDEO	$374		$2,817		$8		$0
73EAS	ASSY BITE	$372		$2,555		$13		$0
73EAT	PWR SUPLY LOW V	$2,974		$3,404		$19		$0
73EAU	PRNT CIR BRD IN	$349		$1,314		$14		$0
73EAV	CIR BRD ER AMP/	$407		$1,380		$5		$0
73EAW	CIR BRD OUTPT R	$594		$4,898		$29		$15
73EAZ	ASSY RECTFIER B	$18		$0		$0		$0
73EDO	SIGNAL DATA PRO	$21,762		$11,743		$138		$28
73EB3	CHASIS ELCTRNIC	$14		$0		$0		$131
73EB9	NOC	$14		$0		$0		$0
73EBA	ASSY DATA INPUT	$63		$264		$2		$0
73EBB	ASSY ADDER/MEMO	$28		$0		$0		$0
73EBC	ASSY PROCESOR C	$24		$460		$6		$0
73EBH	ASSY INSTRCTION	$120		$1,026		$5		$0
73EBJ	ASSY STR CONT R	$60	P	$0	P	$0		$0
73EBK	ASSY DRIVR TRAN	$59		$473		$3		$0
73EBL	ASSY STORE CONT	$70		$0		$0		$0
73EBM	ASSY CORE PLANE	$70		$222		$2		$490
73EBP	ASSY ANALOG OUT	$287		$2,717		$5		$166
73EBQ	ASSY ANALOG INP	$295		$3,182		$7		$0
73EBR	ASSY RATE-DEFL	$7		$284		$1		$0
73EBT	ASSY FUNCTION C	$74		$204		$2		$0
73EBU	ASSY CLOCK CHEK	$204		$312		$2		$0
73EBV	ASSY PARAMETR C	$21		$101		$1		$0
73EBX	PWR SUPLY 5 VOL	$4		$179		$4		$0
73EBZ	PWR SUPPLY LOW	$42		$220		$4		$0
73ECO	MT ELECT EQUIPM	$2,297	P	$141	P	$6	P	$16
73EDO	WIRING CONNS PI	$32		$0		[illegible]		$0
73EXX		$108,982		$188,335		$4,938		$34,318
73FOO	INERTIAL MSURMN	$69,275		$0		$0		$0
X 73FAO	UNIT INERTIAL M	$69,613	P	$217,833		$3,543	P	$0
73FA9	NOC	$196	P	$0	P	$0	P	$0
73FAD	BOARD CAPRI	$466		$7,337		$9		$0
73FAE	MODULE GIMBAL L	$573		$6,600		$40		$0
73FAF	MODULE PWR SUP	$266		$2,148		$13		$0

F 11
WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) K051.PN4L
AFM 65-110/66-1 DATA AS OF 77 JUN CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73EXX		$113,882		$129,306		$2,971		$1,551
73FOO	INERTIAL MSURMN	$58,282		$0		$0		$0
73FAO	UNIT INERTIAL M	$66,044	P	$105,654		$3,76[illegible]	P	$0
73FAD	BOARD CAPRI	$375	P	$11,172		$13[illegible]	P	$0
73FAE	MODULE GIMBAL L	$270		$1,624		$2[illegible]		$0
73FAF	MODULE PWR SUP	$315		$2,366		$2[illegible]		$0
73FAG	MODULE MODE SWI	$78		$508		$[illegible]		$0
73FAM	ACCLORMETER X-Y	$0		$0		$0		$0
73FAN	ACCLMTER Z AXIS	$0		$0		$0		$0
73FAP	GYROSCPE X-Y AX	$0		$0		$0		$0
73FAQ	GYROSCPE Z AXIS	$0		$0		$0		$0
73FAR	ACCLMTR ELECTRN	$14		$49		$1		$0
73FAS	GYROSCPE ELECTR	$0		$0		$0		$100,068
73FAT	GMDLE TMP CONT	$0		$0		$0		$0
73FAU	AUX TMP CONT AM	$0		$0		$0		$0
73FAV	CLSTR CONT TMPT	$0		$0		$0		$0
73FAW	COMPSATION BOAR	$7		$537		$2		$0
73FBO	RACK ELEC EQUIP	$694		$0		$0		$0
73FCO	CONTROLLER IMS	$1,574		$452		$10		$0
73FCB	FRONT PANEL	$91		$0		$0		$0
73FDO	ADPTR PWR SP LS	$45,304	P	$12,473		$397	P	$0
73FDA	MODULE SEQUENCE	$45		$155	P	$3		$0
73FDB	CARD SEQUENCER	$170		$637		$10		$0
73FDC	CARD SEQUENCER	$127		$620		$8		$0
73FDD	MODULE 800 HZ	$245		$720		$10		$0
73FDE	MODULE HEAD REP	$2,741		$8,316		$174		$0
73FDF	MODULE RELAY DR	$112		$0		$0		$0
73FDG	CARD RELAY DRIV	$153		$710		$8		$0
73FDH	CARD RELAY DRIV	$168		$656		$6		$0
73FDK	DRIVER AMPLIFIE	$24		$0		$0		$467
73FDL	POWER SUPPLY	$28		$161		$4		$0
73FDM	CARD PWR SUPPLY	$273		$1,887		$41		$0
73FDN	CARD PWR SUPPLY	$112		$721		$11		$0
73FDP	CARD PWR SUPPLY	$6		$73		$3		$0
73FDQ	CARD PWR SUPPLY	$154		$2,561		$31		$0
73FDR	CARD PWR SUPPLY	$115	P	$760		$14	P	$0
73FDS	MODULE BITE	$49		$168		$2		$0
73FDT	MOTHER BOARD CL	$112	P	$0	P	$0	P	$0
73FDU	MOTHER BOARD MO	$27	P	$27	P	$0	P	$0
73FEO	MOUNT ADPT/PS	$102		$0		$0		$0
73FFO	BATTERY PACK IM	$35		$0		$0		$0

H 11
WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) K051.PN4L F
AFM 65-110/66-1 DATA AS OF 77 MAR CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	QUARTERLY VALUES: FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
73EBA	ASSY DATA INPUT	$57		$110		$1		$0
73EBB	ASSY ADDER/MEMO	$31	P	$119	P	$1		$0
73EBC	ASSY PROCESOR C	$95		$148		$2		$0
73EBE	ASSY DISCRETE I	$136		$324		$5		$14
73EBH	ASSY INSTRCTION	$71		$513		$2		$0
73EBJ	ASSY STR CONT R	$164	P	$928	P	$3		$0
73EBK	ASSY DRIVR TRAN	$77		$861		$5		$0
73EBL	ASSY STORE CONT	$65		$711		$4		$18
73EBM	ASSY CORE PLANE	$150		$1,391		$9		$2,022
73EBP	ASSY ANALOG OUT	$343	P	$6,658	P	$12	P	$208
73EBQ	ASSY ANALOG INP	$112		$2,590		$4		$0
73EBS	ASSY OVERFLOW R	$4		$0		$0		$0
73EBT	ASSY FUNCTION C	$51		$194		$2		$0
73EBU	ASSY CLOCK CHEK	$134		$584		$3		$0
73EBX	PWR SUPLY 5 VOL	$39		$143		$4		$0
73EBY	ASSY TRANSF/HEA	$14		$0		$0		$0
73EBZ	PWR SUPPLY LOW	$35		$354		$8		$0
73EC0	MT ELECT EQUIPM	$557		$139		$6		$16
73EC9	NOC	$17		$0		$0		$0
73ECA	ASSY FAN	$280		$0		$0		$0
73ED0	WIRING CONNS PI	$141		$0		$0		$0
73EXX		$127,948		$184,153		$6,001		$3,163
73F00	INERTIAL MSURMN	$62,069		$0		$0		$0
73FA0	UNIT INERTIAL M	$66,932	P	$117,998		$2,384	P	$0
73FAD	BOARD CAPRI	$235		$3,840		$6		$0
73FAE	MODULE GIMBAL L	$465		$1,677		$23		$0
73FAF	MODULE PWR SUP	$447		$1,690		$16		$0
73FAG	MODULE MODE SWI	$182		$1,143		$7		$0
73FAM	ACCLORMETER X-Y	$0		$0		$0		$0
73FAN	ACCLMTER Z AXIS	$0		$0		$0		$0
73FAP	GYROSCPE X-Y AX	$0		$0		$0		$0
73FAQ	GYROSCPE Z AXIS	$0		$0		$0		$0
73FAR	ACCLMTR ELECTRN	$0		$0		$0		$108,150
73FAS	GYROSCPE ELECTR	$0		$0		$0		$100,068
73FAT	GMBLE TMP CONT	$0		$0		$0		$0
73FAU	AUX TMP CONT AM	$0		$0		$0		$0
73FAV	CLSTR CONT TMPT	$0		$0		$0		$0
73FAW	COMPSATION BOAR	$0		$0		$0		$0
73FB0	RACK ELEC EQUIP	$2,005		$0		$0		$0
73FC0	CONTROLLER INS	$2,764		[illegible]		[illegible]		[illegible]

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D 11
WEAPON SYSTEM AOO7D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) KU.1.PN4L
AFM 65-110/66-1 DATA AS OF 76 DEC CURRENT QUARTER COMPUTATION DATE PROCESSED

		QUARTERLY VALUES						
WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
73F00	INERTIAL MSURMN	$63,981		$0		$0		$0
X 73FA0	UNIT INERTIAL M	$64,854	P	$156,114		$3,154	P	$0
73FA9	NOC	$528		$0		$0		$0
73FAD	BOARD CAPRI	$486	P	$4,320		$7	P	$0
73FAE	MODULE GIMBAL L	$281	P	$1,972		$27	P	$0
73FAF	MODULE PWR SUP	$199	P	$1,859		$18	P	$0
73FAG	MODULE MODE SWI	$224	P	$889		$6	P	$0
73FAM	ACCLORMETER X-Y	$0		$0		$0		$0
73FAN	ACCLMTER Z AXIS	$0		$0		$0		$0
73FAP	GYROSCPE X-Y AX	$0		$0		$0		$0
73FAQ	GYROSCPE Z AXIS	$0		$0		$0		$0
73FAR	ACCLMTR ELECTRN	$10	P	$452		$2	P	$54,075
73FAS	GYROSCPE ELECTR	$0		$0		$0		$50,034
73FAT	GMDLE TMP CONT	$10		$0		$0		$0
73FAU	AUX TMP CONT AM	$0		$0		$0		$0
73FAV	CLSTR CONT TMPT	$0		$0		$0		$0
73FAW	COMPSATION BOAR	$0		$0		$0		$0
73FDC	RACK ELEC EQUIP	$1,172		$0		$0		$0
73FC0	CONTROLLER IMS	$1,528	P	$678		$14	P	$0
73FC9	NOC	$406		$0		$0		$0
73FCD	FRONT PANEL	$71		$0		$0		$0
73FD0	ADPTR PWR SP LS	$50,200	P	$11,920		$431	P	$0
73FD9	NOC	$15		$0		$0		$0
73FDB	CARD SEQUENCER	$137	P	$441		$7	P	$0
73FDC	CARD SEQUENCER	$93	P	$354		$5	P	$0
73FDD	MODULE 800 HZ	$92	P	$382		$5	P	$0
73FDE	MODULE HEAD REP	$2,975	P	$6,160		$129	P	$0
73FDG	CARD RELAY DRIV	$152	P	$710		$8	P	$0
73FDH	CARD RELAY DRIV	$190	P	$902		$9	P	$0
73FDJ	MODULE RAL-PITC	$108		$0		$0		$0
73FDK	DRIVER AMPLIFIE	$18		$0		$0		$0
73FDL	POWER SUPPLY	$118		$0		$0		$0
73FDM	CARD PWR SUPPLY	$199	P	$1,554		$34	P	$0
73FDN	CARD PWR SUPPLY	$144	P	$721		$11	P	$0
73FDP	CARD PWR SUPPLY	$193	P	$219		$10	P	$0
73FDQ	CARD PWR SUPPLY	$182	P	$1,970		$24	P	$0
73FDR	CARD PWR SUPPLY	$52	P	$380		$6	P	$0
73FDS	MODULE BITE	$7	P	$56		$1	P	$0
73FDT	MOTHER BOARD CL	$4		$0		$0		$0
73FE0	MOUNT ADPT/PS	$216		$0		$0		$0
73FG0	X-TR REMOTE COM	$1,145	P	$165	P	$4		$0
[illegible]	[illegible]	[illegible]		$0		$0		$0

F 11
WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) K051.PN4L
AFM 65-110/66-1 DATA AS OF 76 SEP CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73EAE	ASSY TUBE UNIT	$517	P	$11,492		$82	P	$0
73EAF	ASSY CATHODE RA	$419	P	$9,464		$68	P	$0
73EAK	ASSY CRT MATCHI	$141	P	$80		$1	P	$0
73EAM	PWR SUPLY HIGH	$776	P	$2,898		$28	P	$0
73EAN	MODULE HIGH VOL	$7	P	$0	P	$0		$0
73EAP	PRINTED WIRE BD	$152		$1,146		$2		$0
73EAQ	AMPLIFER DEFLEC	$131	P	$1,216	P	$6	P	$0
73EAR	ASSY VIDEO	$750	P	$15,934		$26	P	$0
73EAS	ASSY BITE	$771	P	$5,407		$21	P	$543
73EAT	PWR SUPLY LOW V	$3,017	P	$1,580		$15	P	$195
73EAU	PRNT CIR BRD IN	$222	P	$2,067		$20	P	$0
73EAV	CIR BRD ER AMP/	$430	P	$1,694		$15	P	$0
73EAW	CIR BRD OUTPT R	$426	P	$7,338	P	$21	P	$0
73EAZ	ASSY RECTFIER B	$7		$0		$0		$0
73EB0	SIGNAL DATA PRO	$42,522	P	$7,916	P	$111		$218
73EB9	NOC	$354		$0		$0		$109
73EBA	ASSY DATA INPUT	$120	P	$880	P	$6		$0
73EBB	ASSY ADDER/MEMO	$148	P	$3	P	$2	P	$0
73EBC	ASSY PROCESOR C	$95	P	$554		$8	P	$0
73EBE	ASSY DISCRETE I	$66		$357		$5		$0
73EBH	ASSY INSTRCTION	$64	P	$684		$3	P	$0
73EBJ	ASSY STR CONT R	$119	P	$696	P	$2		$0
73EBK	ASSY DRIVR TRAN	$118	P	$564		$3	P	$0
73EBL	ASSY STORE CONT	$262	P	$2,746		$15	P	$0
73EBM	ASSY CORE PLANE	$143		$822		$5		$0
73EBP	ASSY ANALOG OUT	$519	P	$21,564		$31	P	$0
73EBQ	ASSY ANALOG INP	$228		$9,984		$16		$855
73EBR	ASSY RATE-DEFL	$67	P	$1,547		$6	P	$0
73EBT	ASSY FUNCTION C	$71	P	$122		$1	P	$0
73EBU	ASSY CLOCK CHEK	$276	P	$2,788		$23	P	$0
73EBV	ASSY PARAMETR C	$14	P	$0	P	$0		$0
73EDX	PWR SUPLY 5 VOL	$28	P	$286		$8	P	$0
73EBZ	PWR SUPPLY LOW	$53	P	$354		$8	P	$0
73EC0	MT ELECT EQUIPM	$515		$0		$0		$0
73ECA	ASSY FAN	$102		$0		$0		$0
73ED0	WIRING CONNS PI	$321		$0		$0		$0
73EXX		$168,406		$248,212		$6,929		$1,920
73F00	INERTIAL MSURMN	$75,870		$0		$0		$0
X 73FA0	UNIT INERTIAL M	$80,377	P	$215,606		$4,313	P	$0
73FA9	NOC	$66		$0		$0		$0
73FAD	BOARD CAPRI	$231	P	$2,212		$6	P	$0
[illegible]	[illegible]	[illegible]	P	[illegible]		$39	P	$0

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WEAPON SYSTEM   A0070   OCALC   LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(G)7213(3)   K051.PN4L
AFM 65-110/66-1 DATA AS OF 76 JUN   CURRENT QUARTER COMPUTATION   DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST	PACK-SHIP COST		CONDEMNATION COST
		-----	-----	QUARTERLY VALUES	-----	-----	-----
73EBU	ASSY CLOCK CHEK	$298	P	$3,416	$18	P	$0
73EBV	ASSY PARAMETR C	$35		$0	$0		$0
73EBX	PWR SUPLY 5 VOL	$10		$0	$0		$0
73EBZ	PWR SUPPLY LOW	$42	P	$372	$8	P	$0
73ECO	MT ELECT EQUIPM	$1,475		$0	$0		$0
73ECA	ASSY FAN	$15		$0	$0		$0
73EDO	WIRING CONNS PI	$172		$0	$0		$0
73EXX		$130,497		$140,172	$5,487		$2,161
73F00	INERTIAL MSURMN	$76,487		$0	$0		$0
X73FA0	UNIT INERTIAL M	$78,458		$41,832	$5,407		$0
73FA9	NOC	$35		$0	$0		$0
73FAD	BOARD CAPRI	$256		$1,506	$5		$0
73FAE	MODULE GIMBAL L	$379	P	$1,616	$28		$0
73FAF	MODULE PWR SUP	$343		$1,452	$18		$0
73FAG	MODULE MODE SWI	$169		$724	$8		$0
73FAM	ACCLORMETER X-Y	$0		$0	$0		$0
73FAN	ACCLMTER Z AXIS	$0		$0	$0		$0
73FAP	GYROSCPE X-Y AX	$0		$0	$0		$0
73FAQ	GYROSCPE Z AXIS	$0		$0	$0		$0
73FAR	ACCLMTR ELECTRN	$0		$0	$0		$0
73FAS	GYROSCPE ELECTR	$0		$0	$0		$0
73FAT	GMBLE TMP CONT	$0		$0	$0		$0
73FAU	AUX TMP CONT AM	$0		$0	$0		$0
73FAV	CLSTR CONT TMPT	$0		$0	$0		$0
73FAW	COMPSATION BOAR	$0		$0	$0		$0
73FBO	RACK ELEC EQUIP	$2,592	P	$0	$4	P	$1,113
73FCO	CONTROLLER IMS	$1,935		$1,888	$39		$0
73FC9	FRONT PANEL	$41		$0	$0		$0
73FDO	ADPTR PWR SP LS	$55,652		$2,925	$99		$0
73FD9	NOC	$214		$0	$0		$0
73FDB	CARD SEQUENCER	$269		$1,770	$12		$0
73FDC	CARD SEQUENCER	$291		$1,050	$8		$0
73FDD	MODULE 800 HZ	$279		$749	$12		$0
73FDE	MODULE HEAD REP	$2,397		$9,867	$212		$0
73FDF	MODULE RELAY DR	$3		$0	$0		$0
73FDG	CARD RELAY DRIV	$172	P	$489	$5	P	$0
73FDH	CARD RELAY DRIV	$43		$216	$3		$0
73FDL	POWER SUPPLY	$45	P	$86	$8	P	$0
[illegible]	CARD PWR SUPPLY	$234		$2,226	$34		$0

WEAPON SYSTEM AOO7C QUAL. LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) FOS FINAL
AFM 65-110/66-1 DATA AS OF 76 MAR CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK-SHIP COST		CONDEMNATION COST
		QUARTERLY VALUES						
73EAK	ASSY CRT MATCHI	$45		$80		$1		$0
73EAM	PWR SUPLY HIGH	$497	F	$294		$12	F	$0
73EAN	MODULE HIGH VOL	$21		$131		$4		$883
73EAP	PRINTED WIRE BD	$75	F	$999		$3	F	$0
73EAQ	AMPLIFER DEFLEC	$197		$700		$4		$0
73EAR	ASSY VIDEO	$481	F	$3,483		$21	F	$0
73EAS	ASSY BITE	$430	F	$1,610		$23	F	$407
73EAT	PWR SUPLY LOW V	$3,685		$0		$0		$0
73EAU	PRNT CIR BRD IN	$270	F	$392		$17	F	$0
73EAV	CIR BRD ER AMP/	$227		$2,248		$10		$0
73EAW	CIR BRD OUTPT R	$453	F	$2,664		$32	F	$0
73EAX	ASSY ELECTRONIC	$59		$0		$0		$0
73EAZ	ASSY RECTFIER B	$64		$264		$2		$0
73EB0	SIGNAL DATA PRO	$31,272	F	$2,810		$139		$0
73EB3	CHASIS ELCTRNIC	$81		$0		$0		$0
73EB9	NOC	$155		$0		$2		$137
73EBA	ASSY DATA INPUT	$14		$333		$1		$0
73EBB	ASSY ADDER/MEMO	$144	F	$1	F	$1	F	$0
73EBC	ASSY PROCESOR C	$17		$182		$5		$0
73EBE	ASSY DISCRETE I	$21		$1		$2		$0
73EBH	ASSY INSTRCTION	$19		$666		$2		$0
73EBJ	ASSY STR CONT R	$56	F	$0	F	$0		$0
73EBK	ASSY DRIVR TRAN	$82		$660		$4		$0
73EBL	ASSY STORE CONT	$24		$0		$0		$0
73EBM	ASSY CORE PLANE	$100		$976		$6		$0
73EBP	ASSY ANALOG OUT	$466	F	$2,394		$17	F	$0
73EBQ	ASSY ANALOG INP	$241	F	$1,313		$10	F	$513
73EBR	ASSY RATE-DEFL	$46		$3		$2		$0
73EBU	ASSY CLOCK CHEK	$194	F	$1,743		$13	F	$0
73EBX	PWR SUPLY 5 VOL	$35		$333		$4		$0
73EBZ	PWR SUPPLY LOW	$67		$744		$16		$0
73EC0	MT ELECT EQUIPM	$789		$0		$0		$0
73ECA	ASSY FAN	$165		$0		$0		$0
73ED0	WIRING CONNS FI	$409		$0		$0		$0
73EXX		$141,502		$176,104		$7,291		$1,940
73F00	INERTIAL MSURMN	$77,998		$0		$0		$0
X 73FA0	UNIT INERTIAL M	$75,966	F	$162,012		$2,877	F	$0
73FA9	NOC	$203		$0		$0		$0
73FC	[illegible]	$319		$6,510		$74		$0

WEAPON SYSTEM AOO7D QUAL LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)7213(3) KOS1.PN4L
AFM 65-110/66-1 DATA AS OF 75 DEC CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES					
73EAK	ASSY CRT MATCHI	$32	P	$0	$1	$0	COST
73EAM	PWR SUPLY HIGH	$417		$294	$12	$0	COST
73EAN	MODULE HIGH VOL	$18	P	$0	$4	$0	COST
73EAP	PRINTED WIRE BD	$32		$333	$1	$0	COST
73EAQ	AMPLIFER DEFLEC	$228		$1,820	$10	$0	COST
73EAR	ASSY VIDEO	$659		$2,979	$18	$0	COST
73EAS	ASSY BITE	$591		$1,932	$25	$475	COST
73EAT	PWR SUPLY LOW V	$1,530		$616	$1	$0	COST
73EAU	PRNT CIR BRD IN	$119	P	$5	$9	$0	COST
73EAV	CIR BRD ER AMP/	$236	P	$1,881	$16	$0	COST
73EAW	CIR BRD OUTPT R	$93	P	$396	$8	$493	COST
73EAZ	ASSY RECTFIER B	$26	P	$0	$1	$0	COST
73EBO	SIGNAL DATA FRO	$20,623	P	$8,430	$419	$0	COST
73EB9	NOC	$71		$0	$0	$0	COST
73EEA	ASSY DATA INPUT	$32		$666	$2	$0	COST
73EBB	ASSY ADDER/MEMO	$150	P	$4	$4	$0	COST
73EBE	ASSY DISCRETE I	$28		$2	$3	$0	COST
73EBH	ASSY INSTRCTION	$28		$999	$2	$0	COST
73EBK	ASSY DRIVR TRAN	$52	P	$0	$2	$0	COST
73EBL	ASSY STORE CONT	$133		$976	$7	$0	COST
73EBM	ASSY CORE PLANE	$52		$488	$3	$0	COST
73EBP	ASSY ANALOG OUT	$189		$1,824	$13	$0	COST
73EBQ	ASSY ANALOG INP	$304		$1,860	$14	$472	COST
73EBR	ASSY RATE-DEFL	$119		$8	$16	$0	COST
73EBT	ASSY FUNCTION C	$25		$0	$0	$0	COST
73EBU	ASSY CLOCK CHEK	$134	P	$891	$7	$0	COST
73EBZ	PWR SUPPLY LOW	$10		$186	$4	$0	COST
73ECO	MT ELECT EQUIPM	$489		$0	$0	$0	COST
73EC9	NOC	$3		$0	$0	$0	COST
73ECA	ASSY FAN	$28		$0	$0	$0	COST
73EDD	WIRING CONNS FI	$28		$0	$0	$0	COST
73EXX		$103,804		$184,186	$5,[illegible]	$1,44[illegible]	COST
73FOO	INERTIAL MSURMN	$61,246		$3,498	$64	$0	COST
73FAD	UNIT INERTIAL M	$57,687		$165,393	$2,970	$0	COST
73FA9	NOC	$17		$0	$0	$0	COST
73FAB	BOARD CAPRI	$612		$1,757	$6	$0	COST

AD-A123 025 A STUDY TO DEMONSTRATE THE APPLICATION OF A GRAPHICAL METHOD TO DETERMINE..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 3/3

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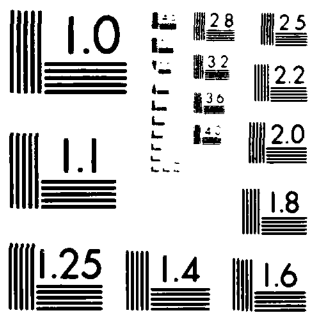

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

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WEAPON SYSTEM   A0070   OCALC   LOGISTIC SUPPORT COST BREAKDOWN RCS LOG-MMO(Q)/213(3)   K051.PN6L
AFM 65-110/66-1 DATA AS OF 75 SEP   CURRENT QUARTER COMPUTATION   DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK-SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES				
73EXX		$120,710	$158,975	$4,656	$606	COST
73F00	INERTIAL MSURMN	$69,212	$0	$0	$0	COST
73FA0	UNIT INERTIAL M	$75,126	P $191,786	$3,942	$0	COST
73FA9	NOC	$38	$0	$0	$0	COST
73FAD	BOARD CAPRI	$544	$5,282	$15	$0	COST
73FAE	MODULE GIMBAL L	$681	$4,6?5	$53	$0	COST
73FAF	MODULE PWR SUP	$291	$3,828	$34	$0	COST
73FAG	MODULE MODE SWI	$312	$3,017	$6	$0	COST
73FAM	ACCLORMETER X-Y	$0	$0	$0	$0	COST
73FAN	ACCLMTER Z AXIS	$7	$0	$0	$0	COST
73FAP	GYROSCPE X-Y AX	$0	$0	$0	$0	COST
73FAQ	GYROSCPE Z AXIS	$0	$0	$0	$0	COST
73FAR	ACCLMTR ELECTRN	$0	$0	$0	$0	COST
73FAS	GYROSCPE ELECTR	$0	$0	$0	$0	COST
73FAT	GMBLE TMP CONT	$0	$0	$0	$0	COST
73FAU	AUX TMP CONT AM	$0	$0	$0	$0	COST
73FAV	CLSTR CONT TMPT	$0	$0	$0	$0	COST
73FAW	COMPSATION BOAR	$0	$0	$0	$0	COST
73FB0	RACK ELEC EQUIP	$1,011	$0	$0	$0	COST
73FC0	CONTROLLER IMS	$1,578	$824	$19	$0	COST
73FC9	NOC	$64	$0	$0	$0	COST
73FCB	FRONT PANEL	$45	$0	$0	$0	COST
73FD0	ADPTR PWR SP LS	$50,685	$0	$0	$0	COST
73FD9	NOC	$441	$0	$0	$0	COST
73FDB	CARD SEQUENCER	$204	$380	$9	$0	COST
73FDC	CARD SEQUENCER	$164	$385	$4	$0	COST
73FDD	MODULE 800 HZ	$28	$54	$2	$0	COST
73FDE	MODULE HEAD REP	$1,257	$2,912	$103	$0	COST
73FDF	MODULE RELAY DR	$4	$0	$0	$0	COST
73FDG	CARD RELAY DRIV	$176	$448	$6	$0	COST
73FDH	CARD RELAY DRIV	$1?5	$720	$7	$0	COST
73FDL	POWER SUPPLY	$00	$280	$16	$0	COST
73FDM	CARD PWR SUPPLY	$494	$4,216	$75	$0	COST
73FDN	CARD PWR SUPPLY	$91	$440	$13	$0	COST
73FDP	CARD PWR SUPPLY	$50	$650	$16	$0	COST
73FDQ	CARD PWR SUPPLY	$276	$2,800	$39	$0	COST
73FDR	CARD PWR SUPPLY	$82	$147	$5	$0	COST

C 10
WEAPON SYSTEM AC07D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO(Q)7213(3) K051.PN4L
AFM 65-110/66-1 DATA AS OF 75 JUN CURRENT QUARTER COMPUTATION DATE PROCESSED

		---QUARTERLY VALUES---						
WUC	NOUN	FIELD MAINT		SPEC REPAIR COST	PACK/SHIP COST		CONDEMNATION COST	BASE MATERIAL COST
73EBZ	PWR SUPPLY LOW	$15		$372	$8		$0	$0
73EBO	SIGNAL DATA PRO	$34,933	P	$5,620	$277	P	$0	$0
73EB9	NOC	$227		$0	$0		$484	$0
73ECA	ASSY FAN	$346		$0	$0		$0	$0
73ECO	MT ELECT EQUIPM	$556		$0	$0		$0	$0
73E00	DIS SYS HEADSUP	$10,766		$0	$0		$0	$0
73EXX		$133,278		$161,788	$5,048		$1,090	$0
73FAD	BOARD CAPRI	$553		$876	$10		$0	$0
73FAE	MODULE GIMBAL L	$707		$1,972	$55		$0	$0
73FAF	MODULE PWR SUP	$446	P	$1,375	$42	P	$0	$0
73FAG	MODULE MODE SWI	$270	P	$531	$9	P	$0	$0
73FAM	ACCLORMETER X-Y	$0		$0	$0		$0	$0
73FAN	ACCLMTER Z AXIS	$0		$0	$0		$0	$0
73FAP	GYROSCPE X-Y AX	$0		$0	$0		$0	$0
73FAQ	GYROSCPE Z AXIS	$28		$0	$0		$0	$0
73FAT	GMBLE TMP CONT	$0		$0	$0		$0	$0
73FAU	AUX TMP CONT AM	$0		$0	$0		$0	$0
73FAH	COMPSATION BOAR	$11		$0	$0		$0	$0
X 73FAO	UNIT INERTIAL M	$79,169		$119,377	$3,926		$0	$0
73FBD	RACK ELEC EQUIP	$942		$0	$0		$0	$0
73FCB	FRONT PANEL	$66		$0	$0		$0	$0
73FCD	CONTROLLER IMS	$1,783		$370	$12		$0	$0
73FC9	NOC	$45		$0	$0		$0	$0
73FDB	CARD SEQUENCER	$171		$1,330	$11		$0	$0
73FDC	CARD SEQUENCER	$143		$814	$9		$0	$0
73FDD	MODULE 800 HZ	$119		$606	$9		$0	$0
73FDE	MODULE HEAD REP	$1,656		$1,560	$167		$0	$0
73FDF	MODULE RELAY DR	$35		$0	$0		$0	$0
73FDG	CARD RELAY DRIV	$111		$410	$8		$0	$0
73FDH	CARD RELAY DRIV	$43		$153	$2		$0	$0
73FDK	DRIVER AMPLIFIE	$76	P	$0	$6	P	$0	$0
73FDL	POWER SUPPLY	$7		$0	$0		$0	$0
73FDM	CARD PWR SUPPLY	$478		$2,100	$72		$0	$0
73FDN	CARD PWR SUPPLY	$220		$980	$23		$0	$0
73FDP	CARD PWR SUPPLY	$211		$660	$35		$0	$0
73FDQ	CARD PWR SUPPLY	$783		$2,380	$82		$0	$0
73FDR	CARD PWR SUPPLY	$181		$473	$18		$0	$0

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WEAPON SYSTEM A007D OCALC LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO(Q)7213(3) K051.PNAL
AFM 65-110/66-1 DATA AS OF 75 MAR CURRENT QUARTER COMPUTATION DATE PROCESSED

AUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES				
73EAQ	AMPLIFER DEFLEC	$155	$420	$2	$0	$0
73EAR	ASSY VIDEO	$167	$1,719	$10	$0	$0
73EAS	ASSY BITE	$354	$752	$11	$0	$0
73EAT	PWR SUPLY LOW V	$2,204	$924	$14	$0	$0
73EAU	PRNT CIR BRD IN	$178	$3	$5	$0	$0
73EAV	CIR BRD ER AMP/	$232	$1,463	$5	$0	$0
73EAW	CIR BRD OUTPT R	$273	P $395	$12	P $595	$0
73EAX	ASSY ELECTRONIC	$14	$0	$0	$0	$0
73EAZ	ASSY RECTFIER D	$43	$0	$0	$0	$0
73EA0	DIS UNIT HEADSU	$80,262	$193,461	$5,551	$0	$0
73EA1	ASSY TERMINAL B	$28	$0	$0	$0	$0
73EA2	SENSOR AUTO BRI	$3	$0	$0	$0	$0
73EA9	NOC	$528	$0	$0	$0	$0
73EDA	ASSY DATA INPUT	$141	$333	$1	$0	$0
73EDB	ASSY ADDER/MEMO	$357	P $1	P $1	P $0	$0
73EDC	ASSY PROCESSOR C	$119	$515	$6	$0	$0
73EDE	ASSY DISCRETE I	$30	$1	$2	$0	$0
[illegible]	ASSY INSTRCTION	$32	$665	$2	$0	$0
[illegible]	ASSY STR CONT R	$43	$111	$1	$0	$0
[illegible]	ASSY DRIVR TRAN	$31	$396	$2	$0	$0
73EDL	ASSY STORE CONT	$30	$241	$2	$0	$0
[illegible]	ASSY CORE PLANE	$337	$1,223	[illegible]	$0	$0
[illegible]	ASSY ANALOG CNT	$477	$3,152	[illegible]	$0	$0
73EXX		$150,180	$215,372	$7,040	$1,330	$0
73FAD	BOARD CABLE	$303	$376	$10	$0	$0
[illegible]	MODULE GIMBAL L	[illegible]	$1,169	$12	$0	$0
73FAF	MODULE PWR SUP	[illegible]	P [illegible]	P $13	P [illegible]	$0
73FA6	MODULE [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$0
73FA0	UNIT INERTIAL N	$87,018	$203,0[illegible]	$3,7[illegible]	[illegible]	$0
73FB0	RACK ELEC EQUIP	$920	$0	$0	$0	$0
73FCB	FRONT PANEL	$7	$0	$0	$0	$0

WEAPON SYSTEM A007D DCALC LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO-Q-7213-3- K051.FNAL
AFM 66-110/66-1 DATA AS OF 74 DEC CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		-----	-----	QUARTERLY VALUES	-----	-----
73EBA	ASSY DATA INPUT	$58	$0	$0	$0	$0
73EBB	ASSY ADDER/MEMO	$131	P $0	P $0	P $0	$0
73EBC	ASSY PROCESSOR C	$29	$182	$5	$0	$0
73EBE	ASSY DISCRETE I	$112	$2	$3	$0	$0
73EBH	ASSY INSTRCTION	$14	$333	$1	$0	$0
73EBK	ASSY DRIVR TRAN	$50	P $0	$2	$0	$0
73EBL	ASSY STORE CONT	$47	$388	$3	$0	$0
73EBM	ASSY CORE PLANE	$241	$1,588	$10	$0	$0
73EBP	ASSY ANALOG OUT	$833	P $5,130	$64	P $0	$0
73EBQ	ASSY ANALOG INP	$80	$458	$3	$0	$0
73EBR	ASSY RATE-DEFL	$120	$7	$6	$0	$0
73EBT	ASSY FUNCTION C	$21	$122	$1	$0	$0
73EBU	ASSY CLOCK CHEK	$71	$372	$2	$0	$0
73EBV	ASSY PARAMETR C	$35	P $0	$1	$0	$0
73EB0	SIGNAL DATA PRO	$40,023	$2,810	$137	$0	$0
73EB3	CHASIS ELCTRNIC	$24	P $20	$2	P $0	$0
73EB9	NOC	$119	P $0	$5	P $0	$0
73ECA	ASSY FAN	$189	$0	$0	$0	$0
73EC0	MT ELECT EQUIPM	$117	$0	$0	$0	$0
73EC9	NOC	$15	$0	$0	$0	$0
73E00	DIS SYS HEADSUP	$8,382	$0	$0	$0	$0
73EXX		$125,333	$187,625	$6,035	$108	$0
73FAD	BOARD CAPRI	$245	$730	$8	$0	$0
73FAE	MODULE GIMBAL L	$274	$638	$18	$0	$0
73FAF	MODULE PWR SUP	$198	$550	$16	$0	$0
73FAG	MODULE MODE SWI	$102	$472	$6	$0	$0
X 73FA0	UNIT INERTIAL M	$58,926	$123,444	$3,476	$0	$0
73FA9	NOC	$118	$0	$0	$0	$0
73FB0	RACK ELEC EQUIP	$916	$0	$0	$0	$0
73FCB	FRONT PANEL	$129	$0	$0	$0	$0
73FC0	CONTROLLER INS	$2,238	$381	$7	$0	$0
73FC9	NOC	$60	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$108	$760	$6	$0	$0
73FDC	CARD SEQUENCER	$140	$1,143	$7	$0	$0
73FDD	MODULE 800 HZ	$293	$507	$7	$0	$0
73FDF	MODULE HEAD REF	$1,492	$2,850	$181	$0	[illegible]

WEAPON SYSTEM A007D DCALC LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMD-Q-7213-3- K051.FNAL
AFM 66-110/66-1 DATA AS OF 74 SEP CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST	PACK/SHIP COST		CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES						
73E[illegible]K	ASSY DRIVR TRAN	$80	P	$0	$4		$0	$0
73E[illegible]L	ASSY STORE CONT	$68		$122	$1		$0	$0
73E[illegible]M	ASSY CORE PLANE	$108		$244	$2		$0	$0
73E[illegible]P	ASSY ANALOG OUT	$448		$2,850	$20		$0	$0
73E[illegible]Q	ASSY ANALOG INP	$144		$1,028	$7		$0	$0
73E[illegible]R	ASSY RATE-DEFL	$374		$1	$1		$0	$0
73E[illegible]S	ASSY OVERFLOW R	$58		$333	$1		$0	$0
73E[illegible]T	ASSY FUNCTION C	$82		$122	$1		$0	$0
73E[illegible]U	ASSY CLOCK CHEK	$118	P	$188	$2	P	$0	$0
73E[illegible]V	ASSY PARAMETR C	$7	P	$0	$1	P	$0	$0
73E[illegible]X	PWR SUPLY 5 VOL	$88		$333	$4		$0	$0
73E[illegible]Z	PWR SUPPLY LOW	$119		$188	$4		$0	$0
73E[illegible]0	SIGNAL DATA PRO	$42,238	P	$8,182	$305	P	$0	$0
73E[illegible]R	MAGNETIC ASSY	$28		$0	$0		$0	$0
73E[illegible]S	CHASSIS ELCTRNIC	$7		$0	$0		$87	$0
73E[illegible]	NOC	$24		$0	$0		$0	$0
73ECA	ASSY FAN	$88		$0	$0		$0	$0
73EC0	NT ELECT EQUIPM	$538		$0	$0		$0	$0
73ED0	DIS SYS HEADSUP	$8,782		$0	$0		$0	$0
73EXX		$138,393		$149,101	$4,889		$318	$0
73FAD	BOARD CAPRI	$885		$3,524	$78		$0	$0
73FAE	MODULE GIMBAL L	$978		$2,378	$88		$0	$0
73FAF	MODULE PWR SUP	$544		$1,705	$50		$0	$0
73FAG	MODULE MODE SWI	$391		$1,180	$18		$0	$0
73FAJ	FAN	$7		$0	$0		$0	$0
X 73FA0	UNIT INERTIAL M	$78,344		$138,453	$3,889		$0	$0
73FA8	NOC	$35		$0	$0		$0	$0
73FB0	RACK ELEC EQUIP	$418		$0	$0		$0	$0
73FCB	FRONT PANEL	$21		$0	$0		$0	$0
73FC0	CONTROLLER INS	$1,400		$508	$10		$0	$0
73FDA	MODULE SEQUENCE	$81		$0	$0		$0	$0
73FDB	CARD SEQUENCER	$175		$780	$8		$0	$0
73FDC	CARD SEQUENCER	$198		$1,397	$3		$0	$0
73FDD	MODULE 800 HZ	$343		$837	$10		$0	$0
73FDE	MODULE HEAD REP	$971		$1,824	$103		$0	$0

WEAPON SYSTEM A007D DCALC LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO-Q-7213-3- K051.FN4L
AFM 65-110/66-1 DATA AS OF 74 JUN CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES				
73XXX		$89,243	$129,110	$2,725	$1,954	$0
73FAD	BOARD CAPRI	$83	$857	$5	$0	$0
73FAE	MODULE GIMBAL L	$538	$1,180	$23	$0	$0
73FAF	MODULE PWR SUP	$374	$1,155	$24	$0	$0
73FAG	MODULE MODE SWI	$213	$1,003	$10	$0	$0
73FAP	GYROSCOPE X-Y AX	$37	$0	$0	$0	$0
73FAQ	UNIT INERTIAL M	$55,584	$281,415	$3,898	$0	$0
73FAS	NOC	$2	$0	$0	$0	$0
73FB0	RACK ELEC EQUIP	$587	$0	$0	$0	$0
73FCB	FRONT PANEL	$62	$0	$0	$0	$0
73FC0	CONTROLLER INS	$1,677	$404	$7	$0	$0
73FC9	NOC	$2	$0	$0	$0	$0
73FDA	MODULE SEQUENCE	$5	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$137	$725	$8	$0	$0
73FDC	CARD SEQUENCER	$108	$808	$5	$0	$0
73FDD	MODULE 800 HZ	$384	$458	$8	$0	$0
73FDE	MODULE HEAD REP	$1,343	$2,180	$112	$0	$0
73FDF	MODULE RELAY DR	$54	$0	$0	$0	$0
73FDG	CARD RELAY DRIV	$120	$561	$8	$0	$0
73FDH	CARD RELAY DRIV	$81	$295	$3	$0	$0
73FDK	DRIVER AMPLIFIE	$5	$0	$0	$0	$0
73FDM	CARD PWR SUPPLY	$398	$1,808	$42	$0	$0
73FDN	CARD PWR SUPPLY	$152	$784	$9	$0	$0
73FDP	CARD PWR SUPPLY	$103	$201	$7	$0	$0
73FDQ	CARD PWR SUPPLY	$380	$1,800	$42	$0	$0
73FDR	CARD PWR SUPPLY	$128	$488	$10	$0	$0
73FDS	MODULE BITE	$98	$370	$3	$0	$0
73FDU	MOTHER BOARD MO	$54	$0	$0	$0	$0
73FD0	ADPTR PWR SP LS	$42,389	$2,004	$72	$0	$0
73FD9	NOC	$225	$0	$0	$0	$0
73FE0	MOUNT ADPT/PS	$108	$0	$0	$0	$0
73FFA	BATTERY CHARGER	$289	$0	$12	$105	$0
73FFB	CHARGER PC BD	$9	$0	$0	$0	$0
73FFC	BATRY MTER ASSY	$3,215	$29	$101	$0	$0
73FF0	BATTERY PACK IN	$2,837	$3,200	$28	$0	$0
73FF9	NOC	$48	$0	$0	$0	$0
73G00	XMTR REMOTE CON	$274	$0	$0	$0	$0
73G00	INERTIAL NAVIGA	$48,052	$0	$0	$0	$0

WEAPON SYSTEM A007D DCAMA LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO-Q-7213-3- K051. N4L
AFM 65-110/66-1 DATA AS OF 74 MAR CURRENT QUARTER COMPUTATION DATE PROCESS

		QUARTERLY VALUES				
WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
73E00	DIS SYS HEADSUP	$5,537	$0	$0	$0	$0
73EXX		$72,233	$125,950	$2,971	$1,643	$0
73FA0	BOARD CAPRI	$185	$360	$3	$0	$0
73FAE	MODULE GIMBAL L	$355	$754	$15	$0	$0
73FAF	MODULE PWR SUP	$269	$324	$7	$0	$0
73FAG	MODULE MODE SWI	$77	$408	$4	$0	$0
73FAM	ACCLOMETER X-Y	$38	$0	$0	$0	$0
73FAR	ACCLMTR ELECTRN	$21	$0	$0	$0	$0
73FA0	UNIT INERTIAL M	$43,003	$192,469	$2,711	$0	$0
73FA9	NOC	$4	$0	$0	$0	$0
73FB0	RACK ELEC EQUIP	$278	$0	$0	$0	$0
73FCB	FRONT PANEL	$104	$0	$0	$0	$0
73FC0	CONTROLLER IMS	$738	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$108	$385	$3	$0	$0
73FDC	CARD SEQUENCER	$103	$400	$2	$0	$0
73FDD	MODULE 800 HZ	$99	$211	$3	$0	$0
73FDE	MODULE HEAD REP	$728	$1,068	$21	$0	$0
73FDF	MODULE RELAY DR	$28	$50	$1	$0	$0
73FDG	CARD RELAY DRIV	$49	$150	$2	$0	$0
73FDH	CARD RELAY DRIV	$83	$232	$2	$0	$0
73FDJ	MODULE ROL-PITC	$98	$0	$0	$0	$0
73FDK	DRIVER AMPLIFIE	$7	P $0	$1	P $0	$0
73FDM	CARD PWR SUPPLY	$115	$888	$9	$0	$0
73FDN	CARD PWR SUPPLY	$89	$388	$5	$0	$0
73FDP	CARD PWR SUPPLY	$47	$198	$7	$0	$0
73FDQ	CARD PWR SUPPLY	$160	$518	$12	$0	$0
73FDR	CARD PWR SUPPLY	$69	$158	$4	$0	$0
73FDS	MODULE BITE	$18	$74	$1	$0	$0
73FDU	MOTHER BOARD MO	$5	$0	$0	$0	$0
73FD0	ADPTR PWR SP LS	$28,594	$0	$0	$0	$0
73FD9	NOC	$764	$0	$0	$0	$0
73FE0	MOUNT ADPT/PS	$277	$0	$0	$0	$0
73FFA	BATTERY CHARGER	$945	P $0	$4	$0	$0
73FFC	BATRY MTER ASSY	$5,497	$19	$88	$0	$0
73FF0	BATTERY PACK IM	$2,298	P $800	$7	P $0	$0
73FG0	XMTR REMOTE COM	$888	$0	$0	$0	$0

WEAPON SYSTEM A007D DCAMA LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO-Q-7213-3- K051.FN4L
APN 85-110/85-1 DATA AS OF 73 DEC CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	QUARTERLY VALUES FIELD MAINT		SPEC REPAIR COST	PACK/SHIP COST		CONDEMNATION COST	BASE MATERIAL COST
73EBK	ASSY DRIVR TRAN	$18		$0	$0		$0	$0
73EBL	ASSY STORE CONT	$15	P	$0	$9		$0	$0
73EBM	ASSY CORE PLANE	$30	P	$0	$5		$0	$0
73EBP	ASSY ANALOG OUT	$114	P	$0	$7		$0	$0
73EBQ	ASSY ANALOG INP	$127	P	$0	$16		$0	$0
73EBR	ASSY RATE-DEFL	$18		$2	$3		$0	$0
73EBS	ASSY OVERFLOW R	$3		$0	$0		$0	$0
73EBT	ASSY FUNCTION C	$9	P	$0	$1		$0	$0
73EBU	ASSY CLOCK CHEK	$29	P	$0	$2		$0	$0
73EBV	ASSY PARAMETR C	$9		$0	$0		$0	$0
73EBZ	PWR SUPPLY LOW	$3	P	$0	$3		$0	$0
73EB0	SIGNAL DATA PRO	$14,577	P	$0	$20		$0	$0
73EB1	CIRCUIT BOARD R	$7		$0	$0		$0	$0
73EB3	CHASIS ELCTRNIC	$32	P	$0	$2	P	$239	$0
73EB4	ASSY RECTFIER B	$7		$0	$0		$0	$0
73EB9	NOC	$134		$0	$0		$0	$0
73ECA	ASSY FAN	$80		$0	$0		$0	$0
73EC0	NT ELECT EQUIPM	$137		$0	$0		$0	$0
73E00	DIS SYS HEADSUP	$8,481		$0	$0		$0	$0
73EXX		$58,380		$7	$2,599		$239	$0
73FAD	BOARD CAPRI	$303		$3,848	$5		$0	$0
73FAE	MODULE GIMBAL L	$288		$2,338	$16		$0	$0
73FAF	MODULE PWR SUP	$203		$1,520	$12		$0	$0
73FAG	MODULE MODE SWI	$384		$2,040	$9		$0	$0
X 73FA0	UNIT INERTIAL N	$40,731		$150,388	$2,659		$0	$0
73FB0	RACK ELEC EQUIP	$780		$0	$0		$0	$0
73FCA	ASSY MECHANICAL	$3		$0	$0		$0	$0
73FCB	FRONT PANEL	$77		$0	$0		$0	$0
73FC0	CONTROLLER INS	$1,231		$400	$7		$0	$0
73FC9	NOC	$8		$0	$0		$0	$0
73FDB	CARD SEQUENCER	$72		$385	$3		$0	$0
73FDC	CARD SEQUENCER	$98		$400	$2		$0	$0
73FDD	MODULE 800 HZ	$88		$211	$3		$0	$0
73FDE	MODULE HEAD REP	$1,003		$1,289	$27		$0	$0
73FDF	MODULE RELAY DR	$9		$0	$0		$0	$0
73FDG	CARD RELAY DRIV	$32		$100	$1		$0	$0

WEAPON SYSTEM A007D OCAMA LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO<Q>7213<3> K051.PN4L
AFM 65-110/66-1 DATA AS OF 73 SEP CURRENT QUARTER COMPUTATION DATE PROCESSED

		----QUARTERLY VALUES----				
WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
73EBT	ASSY FUNCTION C	$40	P $0	$1	P $0	$0
73EBU	ASSY CLOCK CHEK	$121	P $0	P $5	P $0	$0
73EBV	ASSY PARAMETR C	$5	$0	$0	$0	$0
73EBX	PWR SUPLY 5 VOL	$13	$0	$0	$0	$0
73EBZ	PWR SUPPLY LOW	$3	P $0	$3	$0	$0
73EBO	SIGNAL DATA PRO	$28,930	P $0	$260	$0	$0
73EBS	CHASIS ELCTRNIC	$127	$0	$0	$60	$0
73EB9	NOC	$242	$0	$0	$0	$0
73ECA	ASSY FAN	$294	$0	$0	$0	$0
73ECO	NT ELECT EQUIPM	$249	$0	$0	$0	$0
73EOO	DIS SYS HEADSUP	$13,446	$0	$0	$0	$0
73EXX		$103,238	$24	$3,894	$4,108	$0
73FAD	BOARD CAPRI	$282	$1,872	$2	$0	$0
73FAE	MODULE GIMBAL L	$375	$588	P $0	$0	$0
73FAF	MODULE PWR SUP	$152	P $3,428	P $7	$0	$0
73FAG	MODULE MODE SWI	$127	$1,080	$2	$0	$0
73FAH	ACCLOROMETER X-Y	$2	$0	$0	$0	$0
73FAO	UNIT INERTIAL N	$44,290	$215,084	$3,173	$0	$0
73FBO	RACK ELEC EQUIP	$101	$0	$0	$0	$0
73FCB	FRONT PANEL	$25	$0	$0	$0	$0
73FCO	CONTROLLER INS	$1,197	$300	$5	$0	$0
73FC9	NOC	$19	$0	$0	$0	$0
73FDA	MODULE SEQUENCE	$3	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$171	$154	$1	$0	$0
73FDC	CARD SEQUENCER	$127	$100	$1	$0	$0
73FDD	MODULE 800 HZ	$28	$118	$1	$0	$0
73FDE	MODULE HEAD [illegible]	$831	$1,248	$24	$0	$0
73FDF	MODULE RELAY DR	$9	$0	$0	$0	$0
73FDG	CARD RELAY DRIV	$79	$150	$2	$0	$0
73FDH	CARD RELAY DRIV	$59	$174	$2	$0	$0
73FDJ	MODULE ROL-PITC	$18	$0	$0	$0	$0
73FDM	CARD PWR SUPPLY	$290	$1,376	$19	$0	$0
73FDN	CARD PWR SUPPLY	$79	$291	$4	$0	$0
73FDP	CARD PWR SUPPLY	$110	$198	$7	$0	$0
73FDQ	CARD PWR SUPPLY	$201	$808	$18	$0	$0
73FDR	CARD PWR SUPPLY	$57	$104	$1	$0	$0
73FDS	MODULE BITE	[illegible]	[illegible]	[illegible]		

WEAPON SYSTEM A007D OCAMA LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG-MMO<Q>7213<3> K051.FNAL
AFM 66-110/SS-1 DATA AS OF 73 JUN CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES				
73ECA	ASSY FAN	$71	$0	$0	$0	$0
73EC0	NT ELECT EQUIPM	$345	$0	$0	$0	$0
73E00	DIS SYS HEADSUP	$16,501	$0	$0	$0	$0
73EXX		$128,383	$19	$2,281	$0	$0
73FAD	BOARD CAPRI	$143	$71	$1	$0	$0
73FAE	MODULE GIMBAL L	$307	$67	P $0	$0	$0
73FAF	MODULE PWR SUP	$289	P $424	P $9	$0	$0
73FAG	MODULE MODE SWI	$138	$342	$3	$0	$0
73FAH	GYROSCPE ELECTR	$28	$0	$0	$0	$0
X 73FA0	UNIT INERTIAL N	$51,740	P $321,888	$3,424	$0	$0
73FA9	NOC	$5	$0	$0	$0	$0
73FB0	RACK ELEC EQUIP	$140	$0	$0	$0	$0
73FCB	FRONT PANEL	$2	$0	$0	$0	$0
73FC0	CONTROLLER INS	$1,382	$198	$3	$0	$0
73FC9	NOC	$21	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$121	$300	$2	$0	$0
73FDC	CARD SEQUENCER	$108	$98	$1	$0	$0
73FDD	MODULE 800 HZ	$158	P $0	$1	$0	$0
73FDE	MODULE HEAD REF	$849	P $1,011	$22	$0	$0
73FDG	CARD RELAY DRIV	$197	P $198	$3	$0	$0
73FDH	CARD RELAY DRIV	$111	$228	$2	$0	$0
73FDK	DRIVER AMPLIFIE	$15	$0	$0	$0	$0
73FDL	POWER SUPPLY	$74	$0	$0	$0	$0
[illegible]DM	CARD PWR SUPPLY	$143	$588	$8	$0	$0
[illegible]DN	CARD PWR SUPPLY	$32	$0	$0	$0	$0
73FDP	CARD PWR SUPPLY	$150	$192	$7	$0	$0
73FDQ	CARD PWR SUPPLY	$185	$504	$12	$0	$0
73FDR	CARD PWR SUPPLY	$45	$100	$1	$0	$0
73FDS	MODULE BITE	$28	$144	$1	$0	$0
73FDU	MOTHER BOARD HO	$29	$0	$0	$0	$0
73FD0	ADPTR PWR SP LS	$38,970	P $0	$28	$0	$0
73FD9	NOC	$10	$0	$0	$0	$0
73FE0	MOUNT ADPT/PS	$78	$0	$0	$0	$0
73FFA	BATTERY CHARGER	$815	$0	$0	$0	$0
73FFB	CHARGER PC BD	$58	$0	$0	$0	$0
73FFC	BATRY HTER ASSY	$5,205	$19	$88	$0	$0

WEAPON SYSTEM A007D OCAMA LOGISTIC SUPPORT COST BREAKDOWN RCS:LOG MMO(Q)7213-3. K051.PN4L
AFM 65-110/66-1 DATA AS OF 73 MAR CURRENT QUARTER COMPUTATION DATE PROCESSED

WUC	NOUN	FIELD MAINT		DEPOT REPAIR COST		PACK SHIP COST		CONDEMNATION COST	BASE MATERIAL COST
		QUARTERLY VALUES							
73EBX	PWR SUPLY 5 VOL	$22	P	$0		$6		$0	$0
73EB2	PWR SUPPLY LOW	$28	P	$0		$5		$0	$0
73EB0	SIGNAL DATA PRO	$27,230	P	$0		$278		$0	$0
73EB3	CHASIS ELCTRNIC	$9		$0		$0		$0	$0
73EC0	MT ELECT EQUIPM	$263		$0		$0		$0	$0
73E00	DIS SYS HEADSUP	$20,229		$0		$0		$0	$0
73EXX		$103,452		$13		$3,313		$6,856	$0
73FAD	BOARD CAPRI	$341		$284		$2		$0	$0
73FAE	MODULE GIMBAL L	$85		$232	P	$0		$0	$0
73FAF	MODULE PWR SUP	$453	P	$216	P	$5		$0	$0
73FAG	MODULE MODE SWI	$124		$58		$1		$0	$0
73FAP	ACCLMTR ELECTRN	$7		$0		$0		$0	$0
73FAC	UNIT INERTIAL M	$47,143		$143,452		$1,330		$0	$0
73FA0	NOC	$37		$0		$0		$0	$0
73FB0	RACK ELEC EQUIP	$80		$0		$0		$0	$0
73FCB	FRONT PANEL	$24		$0		$0		$0	$0
73FC0	CONTROLLER IMS	$1,632		$510		$9		$0	$0
73FDA	MODULE SEQUENCE	$13		$0		$0		$0	$0
73FDB	CARD SEQUENCER	$88		$75		$1		$0	$0
73FDC	CARD SEQUENCER	$45		$0		$0		$0	$0
73FDD	MODULE 800 HZ	$203	P	$0		$1		$0	$0
73FDE	MODULE HEAD REF	$1,271	P	$816		$24	P	$0	$0
73FDG	CARD RELAY DRIV	$82		$50		$1		$0	$0
73FDH	CARD RELAY DRIV	$13		$58		$1		$0	$0
73FDL	MODULE ROLL-PITC	$51		$0		$0		$0	$0
73FDM	CARD PWR SUPPLY	$171		$1,204		$16		$0	$0
73FDN	CARD PWR SUPPLY	$37		$300		$4		$0	$0
73FDP	CARD PWR SUPPLY	$37		$130		$5		$0	$0
73FDQ	CARD PWR SUPPLY	$233		$864		$21		$0	$0
73FDR	CARD PWR SUPPLY	$237		$364		$4		$0	$0
73FD0	ADPTR PWR SP [illegible]	$32,558	P	$72		$16		$0	$0
73FE0	NOC	$24		$0		$0		$0	$0
73FE0	MOUNT ACPT PL	$132		$0		$0		$0	$0
73FFA	BATTERY CHARGER	$1,27[illegible]		$0		$0		$0	$0
73FFB	CHARGER PC BD	$24	P	$0		$2		$0	$0
73FFC	BATRY HTER ASSY	$6,284		$23		$34		$0	$0
73FFD	BATTERY PACK IM	$3,07[illegible]	P	$0		$8		$0	$0

WEAPON SYSTEM A007D OCAMA LOGISTIC SUPPORT COST BREAKDOWN [illegible]
AFM 65-110/66-1 DATA AS OF 72 DEC CURRENT QUARTER COMPUTATION [illegible]

		QUARTERLY VALUES							
WUC	NOUN	FIELD MAINT		SPEC REPAIR COST		PACK SHIP COST		[illegible]	[illegible]
73EA9	NOC	$200		$0		$0		[illegible]	[illegible]
73EBA	ASSY DATA INPUT	$9	P	$0		$1		[illegible]	[illegible]
73EBB	ASSY ADDER/MEMO	$130	P	$2		[illegible]		[illegible]	[illegible]
73EBC	ASSY PROCESOR C	$28	P	$0		$1		[illegible]	[illegible]
73EBE	ASSY DISCRETE I	$6		$0		[illegible]		[illegible]	[illegible]
73EBH	ASSY INSTRCTION	$38	P	$0		$1		[illegible]	[illegible]
73EBJ	ASSY STR CONT R	$73	P	$1		$3		[illegible]	[illegible]
73EBK	ASSY DRIVR TRAN	$19	P	$0		$1		[illegible]	[illegible]
73EBL	ASSY STORE CONT	$41	P	$0		$1		[illegible]	[illegible]
73EBM	ASSY CORE PLANE	$45	P	$0		$1		[illegible]	[illegible]
73EBP	ASSY ANALOG OUT	$392	P	$0		$5	P	[illegible]	[illegible]
73EBQ	ASSY ANALOG INP	$108	P	$0		$5		[illegible]	[illegible]
73EBR	ASSY RATE-DEFL	$22		$1		$1		[illegible]	[illegible]
73EBS	ASSY OVERFLOW R	$25	P	$0		$1		[illegible]	[illegible]
73EBT	ASSY FUNCTION C	$37	P	$0		$2		[illegible]	[illegible]
73EBU	ASSY CLOCK CHEK	$113	P	$0		$3		[illegible]	[illegible]
73EBV	ASSY PARAMETR C	$5		$1		$1		[illegible]	[illegible]
73EBX	PWR SUPLY 5 VOL	$6	P	$0		$3		[illegible]	[illegible]
73EB0	SIGNAL DATA PRO	$28,703	P	$0		$197	P	[illegible]	[illegible]
73EB2	MAGNETIC ASSY	$11		$0		$0		[illegible]	[illegible]
73EB3	CHASIS ELCTRNIC	$21		$0		$0		[illegible]	[illegible]
73ECA	ASSY FAN	$85		$0		$0		[illegible]	[illegible]
73EC0	MT ELECT EQUIPM	$87		$0		$0		[illegible]	[illegible]
73E00	DIS SYS HEADSUP	$19,399		$0		$0		[illegible]	[illegible]
73EXX		$93,674		$12		$2,773		[illegible]	[illegible]
73FAD	BOARD CAPRI	$215		$210		$2		[illegible]	[illegible]
73FAE	MODULE GIMBAL L	$298		$168	P	$0		[illegible]	[illegible]
73FAF	MODULE PWR SUP	$401		$53		$1		[illegible]	[illegible]
73FAG	MODULE MODE SWI	$124		$0		$0		[illegible]	[illegible]
73FA0	UNIT INERTIAL M	$39,361	P	$30,928		[illegible]		[illegible]	[illegible]
73FB0	RACK ELEC EQUIP	$458		$0		$0		[illegible]	[illegible]
73FC0	CONTROLLER IMS	$548		$101		[illegible]		[illegible]	[illegible]
73FDA	MODULE SEQUENCE	$14		$0		[illegible]		[illegible]	[illegible]

WEAPON SYSTEM A0070 OCAMA
AFM 65-110/66-1 DATA AS OF 72 SEP

LOGISTIC SUPPORT COST BREAKDOWN
CURRENT QUARTER COMPUTATION

K051.PN4L
DATE PROCESSED

		QUARTERLY VALUES				
WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNATION COST	BASE MATERIAL COST
73EC0	MT ELECT EQUIPM	$158	$0	$0	$0	$0
73EC9	NOC	$20	$0	$0	$0	$0
73E00	DIS SYS HEADSUP	$10,883	$0	$0	$0	$0
73Exx		$50,313	$8	$3,482	$1,510	$0
73FAD	BOARD CAPRI	$87	$70	$1	$0	$0
73FAE	MODULE GIMBAL L	$146	$58	$0	$0	$0
73FAF	MODULE PWR SUP	$52	$0	$0	$0	$0
73FAG	MODULE MODE SWI	$63	$112	$1	$0	$0
X 73FA0	UNIT INERTIAL M	$41,243	$104,382	$2,249	$0	$0
73FB0	RACK ELEC EQUIP	$562	$0	$0	$0	$0
73FC0	CONTROLLER INS	$780	$505	$5	$0	$0
73FC9	NOC	$24	$0	$0	$0	$0
73FDB	CARD SEQUENCER	$43	$0	$0	$0	$0
73FDC	CARD SEQUENCER	$20	$0	$0	$0	$0
73FD[illegible]	MODULE HEAD REP	$2,388	$890	$33	$0	$0
73FD[illegible]	CARD RELAY DRIV	$37	$0	$0	$0	$0
73FD[illegible]	MODULE ROL-PITC	$5	$0	$0	$0	$0
73FD[illegible]	CARD PWR SUPPLY	$178	$525	$8	$0	$0
73FD[illegible]	CARD PWR SUPPLY	$18	$158	$2	$0	$0
73FD[illegible]	CARD PWR SUPPLY	$108	$320	$12	$0	$0
73FD[illegible]	CARD PWR SUPPLY	$84	$313	$10	$0	$0
73FD[illegible]	CARD PWR SUPPLY	$24	$102	$1	$0	$0
73FDS	MODULE BITE	$8	$74	$1	$0	$0
73FD0	ADPTR PWR SP LS	$30,648	$5,537	$28	$0	$0
73FD9	NOC	$282	$0	$0	$0	$0
73FE0	MOUNT ADPT/PS	$122	$0	$0	$0	$0
73FFA	BATTERY CHARGER	$1,717	$0	$4	$0	$0
73FFB	CHARGER PC BD	$63	$0	$0	$0	$0
73FFC	BATRY HTER ASSY	$8,015	$22	$34	$1,112	$0
73FF0	BATTERY PACK IN	$4,585	$0	$0	$0	$0
73FG0	XMTR REMOTE COM	$751	$0	$0	$0	$0
73F00	INERTIAL NAVIGN	$28,120	$0	$0	$0	$0
73Fxx		$120,279	$111,508	$2,453	$1,112	$0

WEAPON SYSTEM A007D OCAMA
AFM 65-110/68-1 DATA AS OF 72 JUN

WUC	NOUN	FIELD MAINT		SPEC REPAIR COST	[illegible] SHIP	[illegible]	[illegible]
73EAR	ASSY VIDEO	$8	P	$0	$[illegible]	[illegible]	$0
73EAS	ASSY BITE	$45		$0	[illegible]	$	$[illegible]
73EAT	PWR SUPLY LOW V	$811		$0	$	$	$[illegible]
73EAU	PRNT CIR BRD IN	$28		$0	[illegible]	$	$[illegible]
73EAV	CIR BRD ER AMP/	$183		$0	[illegible]	[illegible]	[illegible]
73EAW	CIR BRD OUTPT R	$07	P	$0	$[illegible]	[illegible]	$[illegible]
73EAZ	ASSY RECTFIER B	$186	P	$0	$[illegible]	[illegible]	$[illegible]
73EA0	DIS UNIT HEADUU	$28,221	P	$0	$1,20[illegible]	[illegible]	$[illegible]
73EA9	NOC	$233		$0	$	[illegible]	$[illegible]
73EBA	ASSY DATA INPUT	$22		$0	$[illegible]	[illegible]	[illegible]
73EBB	ASSY ADDER/MEMO	$36		$0	$0	$	[illegible]
73EBC	ASSY PROCESOR C	$34		$0	$0	[illegible]	[illegible]
73EBE	ASSY DISCRETE I	$13		$0	$2		$[illegible]
73EBH	ASSY INSTRCTION	$16		$0	$0	[illegible]	[illegible]
73EBJ	ASSY STR CONT R	$40		$0	$1	$[illegible]	[illegible]
73EBK	ASSY DRIVR TRAN	$44		$0	$0	$[illegible]	[illegible]
73EBL	ASSY STORE CONT	$69		$0	$0	[illegible]	[illegible]
73EBM	ASSY CORE PLANE	$76		$1	$1	$0	[illegible]
73EBP	ASSY ANALOG OUT	$130		$0	$0	$[illegible]	[illegible]
73EBQ	ASSY ANALOG INP	$40		$0	$0	$[illegible]	[illegible]
73EBR	ASSY RATE-DEF[illegible]	$49		$3	$0	[illegible]	[illegible]
73EBS	ASSY OVERFLOW R	$21		$0	$0	[illegible]	[illegible]
73EBT	ASSY FUNCTION C	$66		$0	$0	[illegible]	[illegible]
73EBU	ASSY CLOCK CHEK	$74		$0	$0	[illegible]	[illegible]
73EBV	ASSY PARAMETR C	$21		$0	$0	$	$0
73EBX	PWR SUPLY 5 VOL	$20		$0	$0	$[illegible]	$0
73EBZ	PWR SUPPLY LOW	$54		$0	$0	$[illegible]	$0
73EB0	SIGNAL DATA PRO	$19,761		$0	$0	$[illegible]	$[illegible]
73EB9	NOC	$16		$0	$0	$0	$[illegible]
73ECA	ASSY FAN	$71		$0	$0	$[illegible]	$0
73EC0	MT ELECT [illegible]	$412		$0	$0	$	$
73ED0	DIS [illegible]	$8,533		$0	$0	$	[illegible]
73EXX		$58,027		$10	$1,21[illegible]	$[illegible]	[illegible]
73FAD	BOARD CAPRI	$236		$0	$0	$	$0
73FAE	MODULE GIMBAL L	$145		$0	$0	$0	$0
73FAG	MODULE MODE SWI	$36		$224	$2	$0	$[illegible]
73FAJ	UNIT INERTIAL M	$34,127		$156,426	$814	$0	$0

Weapon System A007D OCAMA Logistic Support Cost Breakdown
AFM 65-110/66-1 Data as of 79 Mar Current Quarter Computation K051.PN4L

QUARTERLY VALUES

WUC	NOUN	FIELD MAINT	SPEC REPAIR COST	PACK/SHIP COST	CONDEMNA-TION COST	BASE MATL COST
73FAO	Unit Inertial M.	71,969	157,325	$2,992	Ø	Ø

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BIOGRAPHICAL SKETCHES OF THE AUTHORS

Captain Douglas C. Beckwith graduated from high school in Pembroke, New York, in 1967. He attended Oklahoma State University from which he received a Bachelor of Science degree in Hotel Administration in May 1973. Commissioned an officer in 1973, he received nine months of formal training at Fort Rucker, Alabama, for subsequent duty as a Flight Examiner Pilot at Minot Air Force Base, North Dakota. He was then transferred to Eglin Air Force Base, Florida, where he performed duties as the Wing H-1F Standardization Pilot and Wing Executive Officer. He then became a Maintenance Supervisor and was assigned to the Air Force Systems Command.

Captain Anthony R. Roclevitch was born 1 January 1953 in Bourne, Massachusetts. He graduated from high school in Wiesbaden, Germany, in 1971. He attended Troy State University where he earned a Bachelor of Science degree in History and received an officer commission through the AFROTC Program in June 1975. He cross-trained from the Administration career field in 1980 and was assigned as OIC of the Aircraft Branch, 1 TFW, Langley Air Force Base, Virginia, from 1980 to 1981. He graduated from the Squadron Officer School with Class 3-79.

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